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Influences on childbearing intentions across the fertility career: demographic and socioeconomic factors and the value of children

Rodolfo A. Bulatao
and James T. Fawcett

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FOREWORD

This study was conducted as part of a program of comparative analyses sponsored by the Panel on Fertility Determinants of the Committee on Population and Demography, National Research Council. The two authors, Rodolfo A. Bulatao and James T. Fawcett, who are both now at the East-West Population Institute, were connected with the panel as staff member and as a panel member, respectively.

The panel was created by the Commission on Behavioral and Social Sciences and Education of the National Research Council, in response to a request from the Agency for International Development, to assess research in the area of fertility determinants in developing countries and make recommendations for further work. As part of its program, the panel commissioned several cross-national studies, with the objectives of determining what could be learned from existing sets of comparative data, improving measurement techniques within a comparative context, exploring linkages between micro and macro analyses, and providing exemplars for comparative work. Other comparative analyses are appearing as World Fertility Survey scientific reports and as Committee on Population and Demography reports, among which this report is listed as No. 25.

The cross-national data from the Value of Children project of the East-West Population Institute and collaborating institutions have been particularly useful to the panel in its work. The data were used in one other comparative study and were drawn on for other aspects of the panel's work, including an analytical review of research on the determinants of fertility in developing countries and a series of studies of the causes of fertility trends in eight countries. The country studies also benefited from previous work of the Committee on Population and Demography to determine actual levels and trends in fertility and mortality in a broad range of developing countries.

The project dealt with in this report was approved by the Governing Board of the National Research Council, whose members are drawn from the councils of the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine. The members of the panel that supervised the work were chosen for their special competences and with regard for appropriate balance from the range of disciplines related to the study of population. This report has been reviewed by a group other than the authors, following procedures approved by the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine.

This work was accomplished with the assistance and advice of a number of individuals and institutions, including the members of the panel. They are listed in Appendix E; other assistance is acknowledged in a following note from the authors.

W. Parker Mauldin
Chair, Panel on Fertility Determinants

PREFACE

The data used in this paper were collected in a collaborative cross-national investigation involving these researchers: Masri Singarimbun and Russell K. Darroch (Indonesia); Sung Jin Lee (Republic of Korea); Rodolfo A. Bulatao (Philippines); Peter S.J. Chen, Betty Jamie Chung, and Eddie Kuo (Singapore); Tom T.H. Sun and Tsong-Shien Wu (Taiwan); Chalio Buripakdi, Nibhon Debavalya, and Visid Prachuabmoh (Thailand); Cigdem Kagitcibasi (Turkey); and Lois W. Hoffman, Fred Arnold, and James T. Fawcett (United States). Support for these studies was provided by a number of institutions, including the East-West Population Institute, the International Development Research Centre, the Ford Foundation, the Rockefeller Foundation, the Smithsonian Institution, the Research Institute for the Study of Man, and the U.S. National Institute for Child Health and Human Development. Most of the present analysis was conducted while the first author was at the National Research Council on the staff of the Panel on Fertility Determinants, which was supported by a grant from the U.S. Agency for International Development. The assistance of Carol Bradford Ward of the Panel staff in this analysis is gratefully acknowledged. Very useful comments on an earlier draft were provided by members of the Panel on Fertility Determinants and reviewers for the Committee on Population and Demography.

ABSTRACT The influence of various determinants of childbearing intentions throughout the fertility career is investigated, using data for seven countries from the Value of Children project. It is hypothesized that several sets of determinants–age and childbearing experience, socioeconomic characteristics, and values and disvalues attached to children–have distinctive effects on fertility intentions at particular parities. Desire for another child and ideal family size are taken to represent fertility intentions. From cognitive-balance principles, it is argued that these two measures are interdependent, and they are treated as jointly determined in two-stage least squares regressions, run first across all parities and then within specific parities. Some hypotheses, particularly those relating to gender preference, receive good support; others, such as those relating to income and education, do not. Mixed results are reported for the predicted effects of values and disvalues. In interpreting the results, attention is directed to contrasts between the two measures of fertility intentions, to the implications of the relative importance of particular factors across countries, and to the usefulness of a perspective on fertility decision making that combines the single-decision and the successive-decisions approaches.

INTRODUCTION

The period when a couple can have children typically extends from marriage to menopause. Within this period, referred to here as the fertility career, many personal and familial changes take place that can be expected to influence the couple's fertility intentions. This paper examines differences across fertility career stages (defined by number of living children) in these various influences: age and childbearing experience, socioeconomic characteristics, the values and disvalues of children, and others. Hypotheses about possible effects are developed, based mainly on previous studies. Data from surveys of the value of children in seven countries–the Philippines, Turkey, Indonesia, Republic of Korea, China (Taiwan), Singapore, and the United States–are used to test these hypotheses.

Several researchers have argued that fertility should be modeled as a sequential process (e.g., Namboodiri, 1972; Hout, 1978): they posit that a couple's childbearing cannot be understood from a single decision early in the marriage, but should instead be analyzed as a series of successive decisions. However, such treatments have not always clarified the advantages of the sequential perspective, or the changes that are most critical in affecting fertility intentions. To highlight the issues involved, it is useful to contrast two polar views of fertility decisions.

Single vs. successive decisions, and an intermediate perspective

In the extreme single-decision perspective, a couple decide about their desired fertility after they elect to marry, and carry out that decision throughout the marriage regardless of circumstances. From this perspective, the initial decision is of prime interest; later stages of the fertility career are relevant only with regard to the couple's success in carrying out their plans. In Easterlin's (1978) terminology, demand for children is fixed at the start, and only the supply of children varies thereafter. A variant of this perspective would allow a couple's single decision to include planned reactions to various contingencies. For example, they might decide at the outset to have four children, but decide further that, if all four are girls, they will go on having children until they have a boy. Thus, although later events in the marriage may exert some influence, demand is still fixed by the single decision.

In the extreme successive-decisions (or sequential) perspective, on the other hand, the couple do not make a commitment to a specific family size at the beginning of the marriage; instead, they decide on each child one by one. Viewing it somewhat differently, their desired family size is recalculated in each successive period. For such a couple, total demand for children is not a useful concept because demand is continually variable, subject to the changing conditions of the couple's lives.

Of course, these extreme views represent convenient assumptions for research rather than descriptions of researchers' beliefs about real-world conditions. Most fertility theorists would probably agree with the intermediate perspective adopted here, which includes both extremes as special cases (see, e.g., Morgan, 1982). It is assumed that a couple make a rough decision about intended family size, perhaps setting a narrow range, early in the marriage, and refine and possibly alter this decision in response to changing circumstances. The relative importance of the original decision varies: it may provide fairly rigid guidelines for the couple's reactions to later events, or it may be very loose and easily overridden upon later reconsideration. The greater the weight given to the original decision, the closer one comes to the extreme single-decision perspective; the greater the weight given to subsequent reconsideration, the closer one comes to the extreme successive-decisions perspective. Of prime interest from the intermediate perspective are the conditions that prompt reconsideration of fertility goals.

The concern of this paper, therefore, is with fertility intentions and the factors that influence them over the course of the fertility career. The intermediate perspective provides a rationale for expecting that some influences will change, while others will not. Although identifying both types of influence will not, strictly speaking, validate the intermediate perspective, it should complicate the espousal of a pure single-decision or successive-decision perspective.

Fertility intentions: ideal family size and desire for another child

From the single-decision perspective, fertility intentions are represented by demand for a total number of children; from the successive-decisions perspective, they are represented by demand for the next child. This distinction is paralleled very roughly in the distinction between measures of ideal family size and desire for another child. In keeping with the intermediate perspective adopted here, this analysis will focus on both measures.

Ideal family size is derived from questions about the total number of children preferred under certain "ideal" circumstances, such as "if one could start childbearing all over again." Desire for another child is derived from questions about whether another child is wanted at the time of the survey, or about the number of additional children wanted at that time. A measure pertaining to having another child can be constructed based on the difference between ideal and actual family size, whereas a measure of total preference can be constructed by adding the additional children wanted to actual family size. Nevertheless, the two measures are phenomenologically distinct; they are usually treated separately (e.g., McClelland, 1983) and are in fact often contrasted, generally to the disadvantage of the ideal family size measure (e.g., Kirk, 1972; Ware, 1974).

Because both measures will be analyzed here, attention should be paid to their interrelationships. It is generally recognized that ideals should affect desires (Ryder and Westoff, 1969), but it has also been argued that the reverse sequence is possible (Kirk, 1972). Most likely, ideals and desires mutually reinforce one another. Cognitive balance theory holds that a person's related attitudes tend to become consistent over time (Heider, 1946; Newcomb, 1953, 1956; Osgood and Tannenbaum, 1955; Festinger, 1957; Fishbein, 1963; see, e.g., Streufert and Streufert, 1978: Chap. 4 for a recent treatment). This general tendency toward cognitive consistency–also referred to, variously, as congruity or consonance–has been demonstrated in scores of experimental studies (e.g., Abelson et al., 1968). Either or both of two interrelated attitudes may be affected by this tendency, the effect being produced not by a logical reasoning process but in fact often unwittingly. Thus, in addition to any relationship due to common antecedents, ideal family size and desire for another child should show some tendency toward mutual equilibration.

Hypotheses about changing influences on intentions

Within the intermediate perspective adopted here, both types of fertility intentions–ideal family size and desire for another child–may be influenced differentially over the fertility career by three major categories of variables: (a) age and childbearing experience; (b) socioeconomic characteristics of the couple; and (c) values and disvalues attached to children. Recent reviews by Namboodiri (1983) and Bulatao and Fawcett (1981) provide a number of hypotheses about sequential fertility decisions, almost all of which involve variables in one or another of these three categories.[1] Two other factors are also mentioned–normative thresholds and homogenization process–though they do not seem as significant.

Age and Childbearing Experience

Age by itself can alter fertility intentions (Rindfuss and Bumpass, 1978). In particular, Bulatao and Fawcett (1981) identify two age effects–one having to do with the initiation of childbearing and the other with its termination. Women who first give birth at a younger age are likely to have subsequent children more rapidly and end up with larger families. A number of U.S. studies support this "early-pregnancy treadmill" effect. Its possible causes include the foreclosure of career options by early childbearing and the effect of higher fecundity on an earlier first birth. Fertility intentions may or may not be implicated in this relationship, which could also depend on factors related to the supply of children. At the other end of the reproductive span, those who have been married longer appear less likely to have additional children; several studies involving regression analyses within parities show a significant negative effect of marriage duration on period fertility (Bulatao and Fawcett, 1981). This effect is at least partly due to lower fecundity and reduced frequency of intercourse, factors that affect the supply of children but not intentions; it may also be due to such couples already having attained their family-size goals. In addition, however, intentions may be affected if older couples consider themselves outside the prime childbearing years: they may worry about health risks, see childbearing as too heavy a burden at their age, or believe that children should have more active parents; they may also be subject to less social pressure to have children.

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[1] These hypotheses are limited to what may be considered sequential effects. Not considered here are more general nonsequential hypotheses–based on past demographic and sociological research, on microeconomic theory, and so on–about the effects of such factors as income, education, and experience of child mortality, especially on total preferences.

Namboodiri identifies a number of experience factors that can lead to adjustments in fertility intentions, primarily through their connection with implementation failures. These include marital dissolution, infant and child mortality, fecundity impairment, unintended pregnancies, and a difference between preferred and actual sex composition.

Marital dissolution may affect fertility if it occurs before fertility plans have been completely carried out. Although this is a disruption in plan implementation and not a change in fertility intentions, it has been shown that the fertility of U.S. women prior to marital dissolution is lower than expected, suggesting that the discord that generally precedes divorce can affect intentions (Thornton, 1978). Marital dissolution may also affect intentions if it is followed by remarriage, which may involve a new "quota" of children for the woman: Thornton (1978) shows that remarriage starts a period of increased fertility in the United States, though this may not make up for the childbearing years lost between unions. Thus remarriage may raise total fertility across marriages. Its effect on fertility intentions for the new marriage is less clear, though it seems likely that a woman will decide on fewer children if she already has some from a previous union, particularly if the divorce imposes additional costs.

Infant and child mortality can affect fertility intentions if they lead to attempts to make up for the lost child. Heer (1983) reviews the research on this question, including studies in Taiwan, Guatemala, and

Egypt, and concludes that some demand for replacement does develop, though on the average this falls short of an attempt at full replacement. He also argues that a replacement effect is more likely to be observed at lower than at higher parities and where contraceptive use is higher.

The effect of fecundity impairment is mainly on the supply side: it does not raise or lower fertility intentions but makes it impossible to implement them. It may therefore be argued that, for sterile couples, measures of fertility intentions have limited usefulness.

The effect of unintended pregnancies on demand may be more important. Although it is difficult to determine whether any particular child was intended or not, there is abundant evidence that unintended births are a common occurrence. Couples may rationalize their unintended pregnancies, deciding after the fact that they really wanted the baby; this is another example of cognitive balance, which also applies to the relationship between attitudes and behavior (e.g., Festinger and Carlsmith, 1959; Bem, 1967; for general discussions, see Ajzen and Fishbein, 1977; Fazio and Zanna, 1981). Thus apparent demand may be increased. The close relation often found between actual and ideal family size, even where contraceptive practice is infrequent, suggests that such rationalization happens frequently (Pullum, 1983).

The gender composition of earlier children can have an effect: in particular cultures, gender preference may lead to higher fertility among couples who do not have the desired number or balance of sons or daughters (see, e.g., Freedman and Coombs, 1974). Although son preference appears to be more common than daughter preference, the preference for balance, or for some minimum number of children of each sex, is even more common worldwide (see Pullum, 1983). McClelland (1979) has argued that the impact of gender preference is more complex than commonly recognized. Besides the agreement between preferred and actual number of children of each sex, one must consider the perceived probability of having sons or daughters and the cost the couple attaches to having an additional child of the "wrong" sex. Thus in some circumstances gender preference could lead to having fewer rather than more children.

Socioeconomic Characteristics

Analyses of the changing effects of socioeconomic characteristics on fertility intentions have focused on income, wage rates, and education.

A number of researchers have investigated the possibility that these characteristics have different effects on fertility at different parities (Namboodiri, 1974; Simon, 1975a, 1975b; Rosenzweig and Seiver, 1975; Rosenzweig, 1976; Seiver, 1978; Snyder, 1978; Hout, 1978; Kyriazis, 1979). Bulatao and Fawcett (1981) attempt to summarize this research under four hypotheses–two relating to income and two to education or wage rates.

From work on microeconomic fertility models (e.g., Becker, 1960; Willis, 1974), and on the basis of general economic principles, it might be expected that income would have a positive effect on fertility preferences, ceteris paribus. However, because income has various indirect effects that operate to counter this "pure" effect, it has been observed that its effect is most often positive at lower levels of development and negative at higher levels (Mueller and Short, 1983). The hypotheses described here are related to this general argument, but more specifically involve differential effects depending on parity. The first hypothesis, which Bulatao and Fawcett label the "income acceleration" effect, is that couples who can afford it have their children more quickly, whereas the poor, ceteris paribus, may postpone their "purchases" of children. Many of the studies just cited found positive effects of permanent income on parity progression at low parities, providing consistent support for this hypothesis. At higher parities, on the other hand, the same studies showed that the effect of income is predominantly negative. Some explanations for this have been offered, none of them compelling; indirect effects of income that reduce demand for children are probably responsible (Mueller and Short, 1983), but the specific explanations proferred amount to little more than the notion that the rich are somehow different when it comes to later childbearing (Bulatao and Fawcett, 1981).

Like income, education is generally expected to have a negative effect on fertility, though curvilinear effects have also been noted (Cochrane, 1979, 1983). The effects of education are linked to those of potential wages because of the strong dependence of the latter on the former. Higher wages and higher education lead to greater occupational involvement and therefore to fertility delay. Several but not all of the studies cited above confirm that more-educated women, or those who can expect higher wages, are more likely to postpone having their first child, and, in some analyses, their second or third child as well. A companion hypothesis is that more-educated women, once they begin giving birth, will bunch their children more closely. The evidence on this hypothesis, however, is weaker; it does not have unequivocal support in any of the regression studies cited.

Values and Disvalues of Children

In addition to economic benefits and costs, values and disvalues of children are construed broadly here to include social and emotional satisfactions and costs that accrue to parents in the course of rearing children. Values and disvalues are subjective or attitudinal, that is, they refer to the *perceived* satisfactions and costs of children. The discussion will give separate consideration to the fertility implications of particular values and disvalues; calculation of a net value including psychosocial dimensions is problematic. It is not known, for example, to what extent people weigh current costs against future gains; perhaps a small degree of certainty about the old age security provided by children is worth a large amount of the physical strains associated with childrearing. Similarly, childrearing responsibilities may be regarded as interfering with the mother's flexibility to do other things, but how this cost stacks up against the positive emotional value of feeling needed is difficult to say. In addition, it may be argued that not all values relate to fertility positively, nor do all disvalues relate to it negatively.

Some studies have examined changes in the values and disvalues of children across parities or life-cycle stages (Bulatao and Arnold, 1977; Bulatao, 1981b; Callan, 1980; Fawcett, 1978; Hoffman, 1978; Townes et al., 1980). These studies have usually traced the prominence of particular values and disvalues across parities, without specifying relationships to fertility intentions or subsequent fertility. Drawing upon these studies, as well as on studies relating values to family-size preferences, the following discussion will cover those values and disvalues important to the initiation of childbearing (the first child), then to middle births (generally the second and third child), and finally to "large" families (four or more children).

Values attached to the first child are largely psychosocial, having to do with the following: the emotional factors of creating and strengthening the primary group, increasing the closeness of the spouses, providing the feeling of love for a child, and anticipating the fun of having children around the house; and the role development factor of achieving adult status. Some researchers have emphasized the emotional factors (Bulatao and Arnold, 1977; Terhune, 1973), and others the role development factor (Hoffman, 1978). Another first-child theme is continuity or carrying on the family name, which Bulatao (1981b) includes with primary-group strengthening as part of establishing the family.

Disvalues associated with the first birth are both economic and noneconomic. The financial costs of children are a consideration at each parity level (e.g., Bulatao and Arnold, 1977; Callan, 1980; Meyer, 1981), although the evidence suggests that such costs affect the timing more than the occurrence of the first birth. The main psychosocial costs of the first child are of two kinds: interference with the marital relationship, including less time with one's spouse, and loss of flexibility and freedom (Bulatao, 1981b; Campbell et al., 1976; Fawcett, 1978). These disvalues should have the greatest impact on the first birth, but should also remain important for the second, given the increased complications of arranging alternative childcare for two children of different ages (Callan, 1980). It should be noted, however, that significant concern with restrictions on freedom appears mainly in the more-developed, lower-fertility societies and not in the less-developed ones (Bulatao, 1979a). Like restrictions on freedom, interference with the wife's work should be most relevant when no children and one child are contrasted; a diminishing but nonnegligible effect may be expected in relation to second and third children as the demands of a growing family make it less and less likely that the wife can handle both an occupational role and a domestic role (Callan, 1980). However, overall, work restrictions are not a prominent disvalue, being clearly overshadowed by restrictions on freedom (Bulatao, 1979a). It could be argued that a modern occupational structure is necessary for this disvalue to become relevant; however, it could also be argued that women's work is more pressing in less-developed societies where households exist closer to subsistence levels.

In the middle segment of the fertility career, a particular value stands out: providing sibling companionship for the first child. Studies have consistently shown this to be a powerful and virtually universal motive for the second child (Bulatao, 1981b; Callan, 1980; Deven, 1981; Terhune, 1974; Townes et al., 1980). Powerful negative stereotypes against only children have been shown to prevail across cultures. However, the sibling companionship value goes beyond that, inspired by beliefs about the positive effects of a boy having a sister, for example, or the idea that sibling companionship is qualitatively superior to peer companionship and therefore should be maximized. Perhaps for such reasons, studies show the effect of the sibling companionship value continuing beyond the second child, albeit at a reduced level. Emotional benefits to the parents remain important for the second child; indeed, there is some evidence that they intensify (Fawcett, 1978) and that the initial experience of parenting brings about a generally more positive orientation toward having children (Hoffman, 1978; Townes et al., 1980). Further impetus for a second child derives from the various manifestations of gender preference. Even where the first child is of the preferred sex, there is often a desire for a "balance" of boys and girls or, in cases of extreme son preference, a feeling that at least two boys are needed to ensure that one will survive (Lee and Kim, 1977; Williamson, 1976; Arnold and Kuo, 1982; Bulatao, 1981a). Though gender preference motives begin to surface with the second child, they are expected to have modest effects at that point, increasing in impact at parities 3 and 4 in most societies.

The desire for "large" families (four or more children) is influenced especially by expectations of economic contributions from children. A variety of research has shown that expectations for economic help from children are associated consistently with higher fertility (Fawcett, 1982). The expectation of old age support, for instance, has a strong linkage with larger family size (De Vos, 1982).

It has been noted that perceived economic costs of children are salient at each parity. However, the evidence on these costs is confusing; measurement problems may be especially acute for this aspect of the value of children (Fawcett, 1983). Numerous studies have shown that financial considerations are the main reason given for limiting family size or for not wanting more than a particular number of children (e.g., Arnold et al., 1975). Some researchers have found that a concern about financial costs differentiates those who want more children from those who do not (Bulatao and Arnold, 1977), but others have found no such differentiation (Meyer, 1981). Also, variations in ways of measuring financial disvalues may influence the point in the fertility career at which an impact is felt (Bulatao and Arnold, 1977; Callan, 1980; Deven, 1981; Townes et al., 1980). It is predicted that financial disvalues will not show independent effects on family-size preferences in all settings, but may do so in countries where a rapid economic transition is in progress, producing a strong financial squeeze on upwardly mobile parents. In such settings, the financial costs of childrearing are especially salient because of the clear tradeoffs for quality of children or a modern parental lifestyle (Coombs, 1980; Mueller, 1972).

Other Factors

Two additional factors affecting fertility intentions, but not easily placed within any of the three major categories discussed above, may be noted: normative thresholds and the homogenization process.

The influence of cultural norms is mentioned by Namboodiri (1983); in particular, it has been argued that norms set minimum numbers of children for couples in particular cultures (Mason, 1983). If these norms exert a strong coercive effect, decisions before and after a couple reaches the minimum prescribed number can be expected to differ. Bulatao and Fawcett (1981) label this the "normative family-size threshold hypothesis": childbearing below some threshold (often difficult to define) is associated with social pressure, whereas childbearing above the threshold involves more calculating self-interest. Empirically, this should show up as a difference in the impact of particular predictors of fertility intentions; for instance, it might be argued that income and education should have little effect on intentions below the threshold–since cultural norms are assumed not to be income- or education-specific–but greater effect above the threshold. It can be seen that this hypothesis provides an alternative explanation for some of the patterns discussed earlier. However, it should be noted that, although a number of authors cite normative thresholds in explaining findings (e.g., Fawcett et al., 1972; Hout, 1978), thresholds have not been clearly established, and the evidence supporting the hypothesis is conflicting and inconsistent. It has also been hypothesized that behavior at the exact point at which the family-size norm is attained will be different from behavior before and after this point: there will be a greater tendency to postpone births or not to have any more once one has reached the norm. However, this hypothesis, propounded by Hout (1978), has little support beyond his study.

A second additional factor influencing fertility intentions is labeled the "homogenization process" by Bulatao and Fawcett (1981). It is argued that couples at higher parities are increasingly homogeneous, since those with effective preferences for fewer children never reach these parities. Empirical support for this hypothesis is adduced from the declining predictability of fertility intentions at higher parities as couples become increasingly similar on factors that might otherwise help predict intentions. However, a study by Snyder (1978) shows increasing rather than decreasing predictability of birth progressions at higher parities; moreover, statistical factors, specifically the evenness or lopsidedness of the split between those wanting and not wanting another child, might account for the declining pattern where it appears.

Summary of Predictions

Cutting through the qualifications in the preceding discussion, the effects of the various factors identified as influencing fertility intentions may be summarized in a set of specific predictions. Most of these predictions relate primarily to intentions regarding continued childbearing; the previous research on which the predictions are based has dealt almost exclusively with such intentions, if not with actual fertility. For total preferences, more involved arguments must be made. From the intermediate sequential perspective adopted here, it may be argued that total preferences do not remain fixed throughout the fertility career and therefore should be subject to some of the same influences affecting intentions to continue childbearing. In addition, following the earlier argument about cognitive balance, total preferences should also be affected by such influences through their effects on intentions to continue childbearing. There is thus some basis for expecting similar effects on total preferences, though previous research has not addressed this directly.

Predictions related to the effects of age and childbearing experience are as follows:

1. Unintended pregnancies (it was argued) should lead to apparently higher fertility preferences because of rationalization.
2. Age at first birth should be negatively related to fertility preferences.
3. Marriage duration should be negatively related to fertility preferences.
4. Marital dissolution may affect intentions through marital discord and remarriage. Because no information on marital discord is available in the data to be used, this factor will not be considered

further here; the effect of remarriage on total fertility would seem to be positive, but the effect on intentions to have children within the current marriage is more likely to be negative.

5. Child loss should lead to greater demand for children if parity is controlled; it should lead to lower demand if number of living children is controlled (because those who have lost children tend to replace them, but not fully). The effects may be greater at lower parities.
6. Gender composition should affect fertility preferences, a less-preferred composition probably leading to higher but possibly in some cases to lower preferences. The prediction of higher preferences is more common.

Finally, fecundity impairment does not so much change intentions as make them irrelevant, and will not be investigated.

Predictions related to the effects of socioeconomic characteristics are fairly succinct:

7. At low parities, the effect of income on fertility intentions will be positive.
8. At high parities, the effect of income will be negative.
9. At low parities, the effect of education will be negative.

For values and disvalues of children, the relevant predictions may be summarized as follows:

10. The economic contributions of children should have a clearcut positive effect on family-size preferences, principally at higher parities.
11. If the importance attached to carrying on the family name has a positive effect, this should be exhibited at lower parities, particularly in relation to the first birth.
12. Gender preference clearly should affect fertility intentions. This influence, probably positive, will be greater in relation to the third and fourth births.
13. The intensity of the psychosocial companionship value of children should have a positive effect primarily on first-birth intentions, but may also affect the second and other lower-order births.
14. Sibling companionship, in particular, should clearly be of positive importance in having a second child. However, because this value

is so strong and virtually everyone wants a second child, its effect may be difficult to observe.

Two values of children discussed earlier have been omitted here: closeness to one's spouse and the attainment of adult status. The reasons for the omissions were empirical. The first of these values was difficult to distinguish in the data from the companionship value of children, and therefore no separate index for it could be constructed. (This was also the case for the associated disvalue of interference with the marital relationship.) Adult status, the second value omitted here, was only weakly favored by respondents in all countries and similarly did not represent a unique dimension in the value inventory.

Predictions related to the disvalues of children, unlike most of the predictions for values, are specific to particular types of social settings:

15. The financial costs of children are not expected to have strong negative effects on desired family size, net of other variables, except in societies where a rapid economic transition is in progress. Any effects should be greater at higher parities.
16. Concern about loss of freedom and restrictions on parents' activities should affect childbearing intentions negatively at lower parities, especially in regard to the first and the second births, but only in more-developed countries.
17. Interference with the wife's work should similarly have its negative effect at lower parities, but this effect should be smaller than that of loss of freedom. There is no particular expectation, however, that this effect will be limited to more-developed countries.

Finally, in regard to the additional factors of normative thresholds and the homogenization process, no specific predictions can be made. Empirical results may be examined to see if the influence of the preceding variables on fertility intentions changes just at or just after some normative family-size threshold; however, what the thresholds are, which influences should change, and how they should change cannot be predicted.

METHOD

Samples

The predictions outlined above will be investigated cross-culturally with data from the Value of Children project, a set of parallel surveys conducted in nine countries in 1975–76. The countries to be included in this analysis are the Philippines, Turkey, Indonesia, South Korea, Taiwan, Singapore, and the United States. (Because of some differences in the surveys, the data for Thailand and West Germany are not adequate for the current analysis.)

The respondents in each country were a sample of between 1,000 and 3,000 currently married women under 40 (in Taiwan, under 45), plus about a quarter of their husbands. The samples were designed to be nationally representative, except in Indonesia, where two ethnic groups on the main island of Java–the Javanese and the Sundanese–were studied. These wives and husbands were interviewed using similar questionnaires translated from a basic English version into the appropriate local languages (and backtranslated for verification). The questionnaires covered a variety of fertility-relevant issues, including values and disvalues of children, fertility histories and preferences, and socioeconomic background (see Bulatao, 1979a, for further details).

Since fecundity impairment prevents carrying out fertility intentions, cases are excluded if the respondent believed the couple was incapable of having another child. In addition, respondents with no children are excluded because some of the measures used in the basic analyses are defined only for those with at least one child, although separate analyses for those without children who did not consider themselves sterile will also be reported. Altogether, close to 11 percent of each sample was left out, except in the United States, where the percentage was twice as large. Anywhere from 5 to 60 percent of those excluded admitted they could not have additional children.

Procedure

The analysis will involve multivariate regressions to predict fertility intentions, first for all respondents and then for those with particular numbers of living children. It will generally be assumed that the effects on fertility intentions of the different factors investigated are linear and additive. However, particular variables with skewed distributions will be normalized as much as possible before being entered into the regressions (roughly following Tukey's [1977] suggestions).

Regressions were run first for all wives and all husbands in each country. Variations on the basic regressions to determine the results of adding or replacing particular variables, to be identified below, were run next. Regressions were also run for subgroups–urban and rural residents, or members of particular ethnic groups. The purpose of these regressions was essentially to test the stability of the results; no hypotheses were formulated about differences between groups.

Finally, respondents within each country-sex group were divided by fertility career stage using number of living children, and regressions run within each subgroup (including, in this case, regressions for those with no living children). For some purposes, it might have been preferable to take child mortality into account in defining fertility stages. However, focusing only on living children can also be justified, since family interaction patterns depend only on living children. In any case, a variable reflecting child mortality will be included in the analysis.

Measures of Fertility Intentions

The dependent variables in these regressions were two measures of fertility intentions. The first of these was a dichotomous variable indicating presence or absence of desire for another child (DAC) (for convenience this was scored as 0 or 10). The second measure, ideal family size (IFS), was the number of children the respondent said she or he would want to have if "starting your family all over again, things being pretty much as they were." The roughly 12 percent of respondents who did not specify a particular number were asked a follow-up question ("Of course it may depend on a number of things, but if it were up to you alone . . ."), to which almost all gave a satisfactory numerical reply.[2] This measure is generally skewed, more in the higher-fertility countries. On the assumption that ideal family size may actually have different meanings in high- and low-fertility areas, different normalizing transformations were applied: the natural log (after adding ½) in the Philippines, Turkey, and Indonesia and the square root (also after adding ½) in the other countries. Applying a similar square root transformation throughout would, however, produce essentially similar regression results.

These two measures were assumed to be jointly dependent, and two-stage least squares (2SLS) regressions were used to predict them. The equations were identified by using separate sets of value and disvalue measures, discussed below, to predict each intention measure. In addition, gender composition and age of the oldest child were included only in the regressions for desire for another child (leaving out ideal family size as a predictor), and residence and media exposure only in the regressions for ideal family size.

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[2] The highest percentage not providing a specific answer to the first question was in the United States (21 percent); the highest percentage unable (or, more likely, unwilling) to provide a specific answer to either question was in Singapore (14 percent). One or two percent was more typical for the other countries. Given that Singapore and the United States were the most developed of the countries studied, the argument that developing-country respondents cannot articulate family-size preferences does not seem to hold here.

Since the desire for another child is a dichotomy, this estimation procedure is not entirely appropriate (but see Heckman, 1978). To determine what difference this made, logit regressions were also run to predict desire for another child and are discussed together with the two-stage results. (Parallel ordinary least squares [OLS] results for ideal family size are also discussed.) Also, desire for another child was replaced, in additional two-stage regressions, by another variable—the number of additional children desired (ACD). This variable could be negative because respondents who wanted no additional children were asked if they would have preferred fewer than they already had, and the number fewer incorporated into the measure; however, the results of using ACD were essentially similar and will therefore not be reported.

Given the skepticism that is sometimes expressed about subjective measures of fertility preferences (e.g., Hauser, 1967; Westoff, 1981; Hendershot and Placek, 1981), somewhat parallel analyses will also be reported using a measure of actual fertility—whether the couple had a live birth within the two years preceding the interview (CHL2).

Predictors of fertility intentions

The predictors used are grouped below in accordance with the predictions outlined above.

Age and Childbearing Experience

Living children. A key variable in predicting the desire for another child is the number of children the respondent already has. After some experimentation with this measure, its log was taken (after adding ½), and both the log (LNLC) and the untransformed number (NLC) included in the regressions for desire for another child. Living children is also included in the regressions for ideal family size, on the assumption that a positive effect could in part represent rationalization.

Age and marriage duration. Several variables were used to capture the effects of age and marriage duration: the age of the oldest child (ROLD); age at first birth (AGFB); and years since first marriage (MDUR) (the duration of the current marriage was not available in the data). Although the age of the oldest child could be expected to affect desire for another child, no good argument could be made for its affecting ideal family size, and it was therefore left out of that equation. The square root was taken of this measure because it gave a better fit.

Marital dissolution. A dummy variable (PREVM) was used to indicate whether the respondent had been married more than once.

Child loss. A dummy variable (CLOSS) was also used to indicate whether any of the respondent's children had died.

Gender composition. The analysis includes measures of the gender composition of living children and the strength of gender preference. For actual composition, the percentage of living male children was calculated, and a logit transformation applied to this (after 0 percent was rescored as 0.5 and 100 as 99.5) (LBOY). This transformation was based on the argument that a difference between, say, 90 and 100 percent girls would have more effect on fertility preferences than a difference between 40 and 50 percent girls. (Empirically, the logit was in fact more strongly related to preferences than was the raw percentage.) Imbalance between number of living sons and daughters, also assumed to be important, was represented by an additional variable—the absolute value of the preceding index (LIMB).

Gender composition was not expected to affect ideal family size: if one could start one's family over again, one would not necessarily expect the same sequence of sons and daughters. Hence, these variables were used only in the regressions for desire for another child. The strength of gender preference was assessed from value of children data, and the measure is discussed below. No measures of the perceived likelihood of having a son or daughter or of the perceived costliness of not having the preferred gender were available in the data.

Socioeconomic Characteristics

Income. The surveys provide limited information on income. Total household income is given, scored in categories that varied across countries, numbering between 8 and 18. No breakdown between husband's and wife's income was obtained. Regressions were run to predict household income category in each country, including in the predictors a dummy for whether the wife was working or not (Appendix A). R^2 was generally between 0.35 and 0.47. From these regressions, rough estimates were derived for the expected income of each household projected to the husband's age 40. Given the inadequacy of the basic income data, this measure of permanent household income (PINC) is deficient, and some regressions will also be reported using the original current household income measure (CINC).

For both measures, a similar distribution approximating the normal was produced in each country by taking the natural log in Turkey, Indonesia, and Singapore and the square root in the Philippines and Korea, and not transforming in Taiwan and the United States. Given the differences in the income measures, however, only very rough comparisons can be made between countries.

Education. Wife's education (WEDUC) was scored in years completed, except for Singapore and Taiwan, where category systems were used. Husband's education (HEDUC) will not be included in the basic regressions because of collinearity with income (particularly permanent income), but some analysis including it will be reported. It was scored in the same way as wife's education.

Two additional measures of socioeconomic characteristics for which no specific predictions were made were included only in the regressions for ideal family size: urban as opposed to rural residence (URBAN) and exposure to mass media (MEDIA), measured on a ten-point scale. It was thought useful to control the effects of these variables, though no specific sequential effects were expected.

Values and Disvalues of Children

From a number of different questions, both open-ended and structured, about the importance of particular values and disvalues of children, two sets of indices were constructed: indices of the importance of particular values and disvalues as reasons for having or not having another child (to use in predicting desire for another child), and indices of their general importance in fertility (to use in predicting ideal family size).

The first of these sets of indices was derived directly from ratings of the personal importance to the respondent of 12 values as reasons for having another child, and similar ratings of 10 disvalues as reasons for not having another child. These ratings were on a three-point importance scale; the mean rating given by each respondent to all the values combined (or all the disvalues combined, in the case of specific disvalues) was subtracted from each score. Ratings of similar values were also averaged. In this manner, five value indices were constructed to represent the importance to the respondent as reasons for having another child of economic contributions from children (ECO), the family name and line (NAM), gender preference (GPR), companionship and psychosocial rewards of childbearing (COM), and sibling companionship (SIB). Unlike the other measures, the gender preference measure was not an average, but was the higher of the two ratings for wanting a son and wanting a daughter. Three disvalue indices were constructed–for the financial costs of children (FIN), restrictions on parents' freedom and activities (FRE), and work restrictions (WRK).

The general indices were constructed through a more complex process. All the measures pertaining to a particular value, including those used in the first set of indices, were combined, taking into account several exploratory factor analyses, as well as theoretical ideas about which values are important. Various transformations were applied to equalize roughly the contribution of different measures in each index, as well as to reduce heteroscedasticity and normalize the final indices, which were designed to range from 0 to 5. The general value indices do not include a measure for sibling companionship, on the assumption that this value applies to particular parities rather than to children generally. The seven general indices are these:

1. Economic contributions from children (ECOV) has three substantive components: help around the house, economic help from children (type and timing not specified), and help in the parents' old age. It should be noted that these contributions are not entirely monetary: "help" can take a number of forms. One constituent measure, for example, is ratings of the item "to have someone to depend on when you are old."

2. Carrying on the family name (NAMV) includes both family name and family line in its constituent measures, so it can apply in cultures where the name itself is unimportant.

3. Gender preference (GPRV) measures the degree to which *either* son or daughter preference is important with respect to wanting another child.

4. Companionship provided by children (COMV) was constructed from items that specify numerous psychosocial benefits to parents: the fun of having children around, pleasure from watching them grow,

avoidance of loneliness, and the value of children for bringing spouses closer and completing the family.

5. Financial costs of children (FIND) was measured by items referring to financial burdens, financial demands, and financial problems connected with children.

6. Restrictions on parents' freedom (FRED) includes measures of feeling less free because of children and of the extent to which childrearing interferes with other activities, but excludes interference with work.

7. Interference with wife's work (WRKD) indicates whether the respondent feels that children either prevent the wife's working or make it more difficult for her to have a job.

The estimated reliability of each index, based on a measure of internal consistency (alpha), is shown in Appendix B (which also provides further details on the construction of these indices). The alpha coefficients vary widely, as might be expected with indices using different numbers and types of components; few of the coefficients are high, and many are rather low (i.e., below 0.50). The most reliable indices, across countries, are those dealing with economic benefits, the family name, gender preference, and financial costs. Two countries have notably low estimates of reliability (all indices below 0.50): the Philippines and Indonesia.

RESULTS

In this section, fertility intentions in each country will first be reviewed. Then means and standard deviations for the predictors will be presented. Next, regression results will be examined: basic results for all parities combined, results with some changes in predictors, results by subgroup, results to predict recent childbearing, and, finally, results for separate regressions by number of living children.

Fertility intentions

Figure 1 shows ideal family size by number of living children for each country-sex group. The contrasts between country samples in mean level generally parallel contrasts in country fertility rates (see Bulatao, 1979b: Table 3), although ideal family size for the Turkish sample is slightly lower than would be expected. These ideals fall below con-

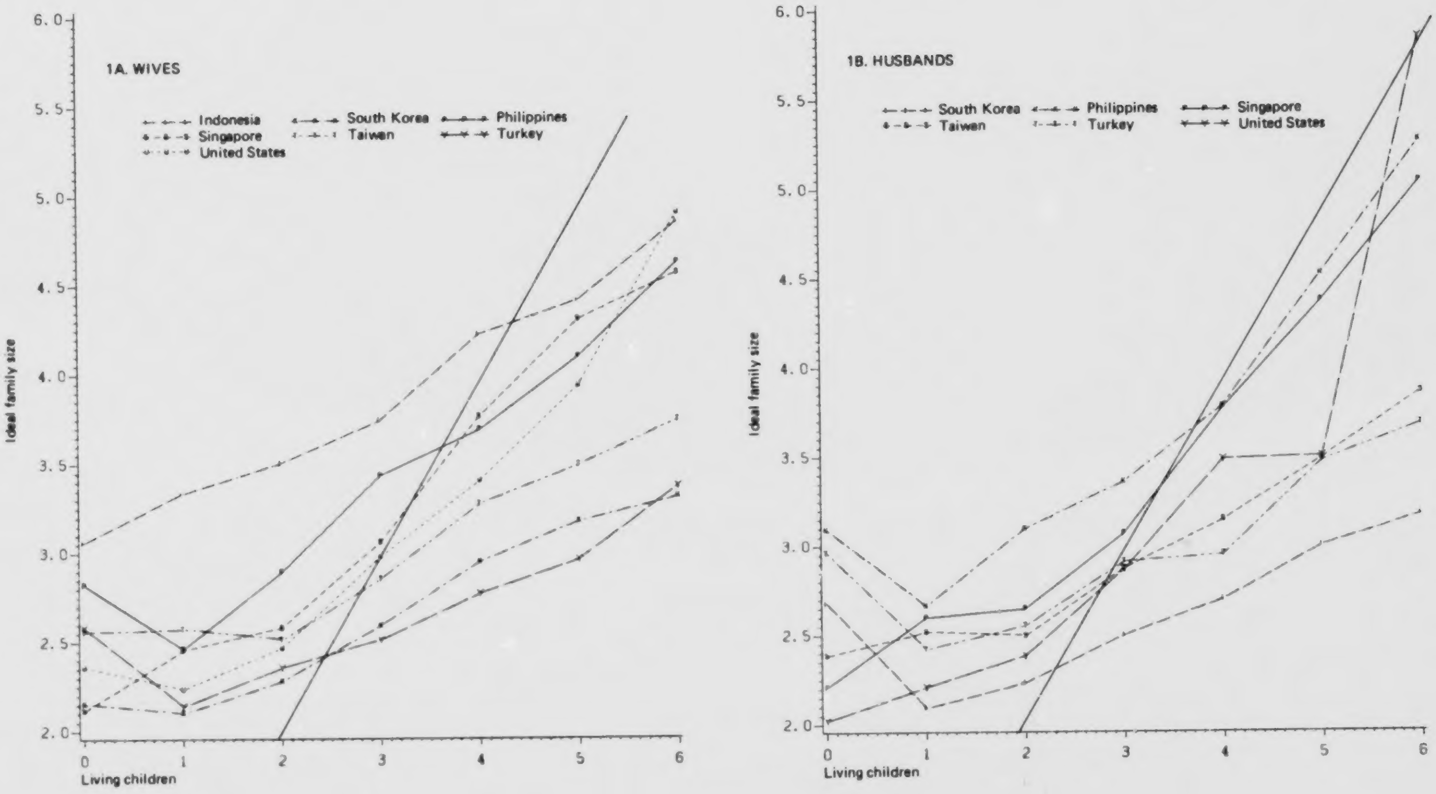

FIGURE 1. Ideal family size by number of living children, by country and sex

temporaneous total fertility rates (roughly adjusted for mortality[3]) in the less-developed countries, but exceed these rates in the more-developed ones. In the Philippines and Turkey, for instance, they are on the order of one child smaller than adjusted total fertility rates, whereas in the United States and Singapore they are about one child larger. Only in Korea and Taiwan are the ideals close–within half a child–of the adjusted rates. In the less-developed countries studied, the ideals suggest some discontinuity with past fertility experience; for the more-developed countries, various explanations for the difference–such as the added cost of attaining one's ideals–are possible.

The trend across parities in ideal family size is roughly similar in each country-sex group: it starts between 2 and 3 for those with no children and increases as number of living children increases. The slope is less than one, however, and for those with six or more children ideal family size is roughly between 3 and 5. Among those with three living children, roughly half of the groups have a mean ideal family size larger than mean current family size, and half have the reverse. The differences between countries are not great: ideal family size is slightly higher at each parity in Indonesia than in the other countries, is slightly lower in Korea, and increases somewhat faster across parities in Singapore. Wives' and husbands' preferences are quite similar.

These similarities suggest similar processes at work in each country: possibly self-selection, in that those with larger ideal family sizes are more likely to attain higher parities, or possibly some degree of cognitive balancing or rationalization. Whichever explanation is correct, or even if both are, the processes do not work perfectly: either some couples overshoot their ideals, or some do not fully adjust their ideals to take in all the children they have.

Figure 2 shows the percentages who desire another child by number of living children for each country-sex group. These percentages are very high–between 80 and 100 percent–for those with no children or one child; intermediate, with the greatest variation among groups, for those with two or three children; and low–between 0 and 25 percent–for those with four or more children.

Differences among country samples are most notable at the inter-

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[3] The mortality adjustment involved multiplying total fertility rates from the Committee on Population and Demography (Coale et al., 1980; National Research Council, 1980) or the U.S. Bureau of the Census (1979) by the NRR/GRR ratio for 1973 (United Nations, 1975).

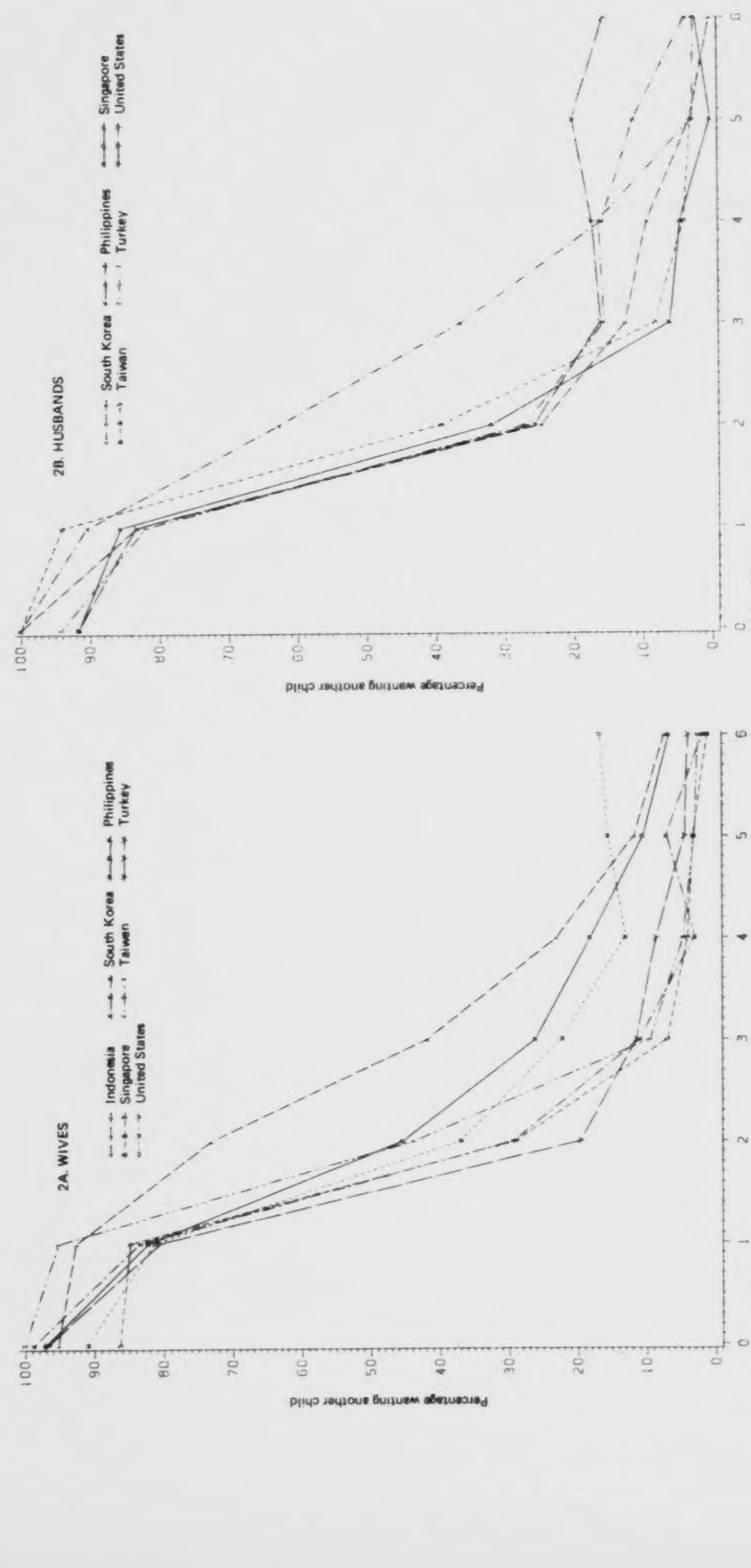

FIGURE 2. Desire for another child by number of living children, by country and sex

mediate parities: the percentage wanting additional children at these parities is higher in Indonesia than elsewhere, and this percentage is also relatively high in the Philippines. Some differences appear between husbands and wives: those wanting additional children are a slightly larger percentage of husbands than wives in the Philippines and Turkey, but a slightly larger percentage of wives than husbands in the United States.

In a broad sense, Figure 2 is consistent with Figure 1 in that the majority of respondents want to stop childbearing somewhere in the range of 2 to 5 children. However, more detailed comparisons show differences between ideal family size and the desire for another child. Those for whom these two measures of intentions conflict are of two types: those who want to continue childbearing even though they would exceed their ideal family size, and those who would discontinue childbearing without having reached their ideal. Each type makes up about 5 to 10 percent of each country-sex group, so that as much as a fifth of some groups clearly show some contradiction between ideals and desires. Overall, those whose desires fall short of their own ideals slightly outnumber those with excess desires. Those whose desires fall short are most numerous at two or three living children; as a proportion of the respondents not wanting another child, they are most common at lower parities, decreasing steadily at higher parities. Those with excess desires, on the other hand, increase at each successive parity as a proportion of the respondents wanting another child, making up almost 100 percent of this group at five or more children; almost everyone wanting another child at these high parities, therefore, would exceed his or her own stated ideals.

This discussion of fertility intentions suggests the importance of a couple's actual number of children in determining intentions. It also illustrates the inadequacy of combining ideal family size and desire for another child and the consequent need to treat them separately.

Means for the predictors

Age, Childbearing Experience, and Socioeconomic Characteristics

Means and standard deviations for all the variables, except the values and disvalues, are given in Table 1 by country and sex. Several of the variables have been transformed, as described earlier, occasionally in different ways across countries. Thus, ideal family size appears lower

TABLE 1. Means and standard deviations, by country and sex

	Wives													
	Philippines		Turkey		Indonesia		Korea		Taiwan		Singapore		United States	
Variable	Mean	(S.D.)	Mean	(S.D.)	Mean	(S.D.)	Mean	(S.D.)	Mean	(S.D.)	Mean	(S.D.)	Mean	(S.D.)
DAC	.30	(.46)	.24	(.43)	.41	(.49)	.26	(.44)	.22	(.41)	.25	(.44)	.42	(.49)
IFS	13.45	(3.45)	10.71	(3.17)	14.78	(2.83)	17.34	(2.56)	18.54	(2.24)	18.85	(2.84)	17.43	(4.17)
ACD	.38	(1.13)	-.14	(1.50)	.75	(1.24)	.02	(1.05)	.11	(.98)	.26	(.84)	.58	(1.40)
LNLC	1.32	(.50)	1.15	(.48)	1.32	(.51)	1.12	(.42)	1.26	(.41)	1.16	(.48)	.96	(.41)
NLC	3.73	(2.06)	3.05	(1.78)	3.72	(2.03)	2.84	(1.37)	3.31	(1.45)	3.08	(1.74)	2.34	(1.26)
ROLD	2.78	(1.04)	2.94	(1.11)	3.14	(1.01)	2.61	(1.05)	2.98	(1.15)	2.95	(1.02)	2.73	(1.06)
AGFB	21.59	(3.81)	19.69	(3.90)	18.40	(3.47)	22.91	(3.08)	21.89	(3.11)	23.03	(4.16)	21.51	(3.75)
MDUR	9.61	(5.76)	11.56	(6.57)	12.07	(5.98)	8.12	(5.69)	11.38	(6.76)	10.36	(6.81)	10.16	(5.44)
PREVM	.02	(.14)	.05	(.21)	.17	(.38)	.01	(.10)	.02	(.12)	.01	(.08)	.13	(.34)
CLOSS	.23	(.42)	.36	(.48)	.38	(.49)	.14	(.34)	.14	(.34)	.04	(.20)	.05	(.21)
LBOY	.10	(1.54)	-.00	(1.71)	.01	(1.56)	.19	(1.71)	.11	(1.49)	.06	(1.65)	.07	(1.95)
LIMB	1.05	(1.13)	1.22	(1.19)	1.07	(1.13)	1.24	(1.19)	1.01	(1.10)	1.16	(1.17)	1.52	(1.22)
PINC	2.62	(.48)	1.86	(.30)	1.89	(.22)	2.01	(.26)	4.70	(1.13)	1.39	(.20)	11.85	(1.62)
CINC	2.44	(.77)	1.74	(.56)	1.72	(.32)	1.92	(.39)	4.91	(1.81)	1.36	(.36)	10.47	(3.54)
WEDUC	7.78	(3.48)	3.41	(3.55)	4.37	(3.74)	7.32	(3.93)	4.70	(3.10)	2.90	(1.32)	12.21	(2.22)
URBAN	.20	(.40)	.81	(.39)	.20	(.40)	.63	(.48)	.51	(.50)	.77	(.42)	.74	(.44)
MEDIA	5.97	(2.17)	5.85	(2.78)	4.56	(2.66)	6.87	(2.38)	5.27	(2.87)	7.78	(2.12)	8.78	(1.49)
CHYNG	2.21	(2.55)	3.70	(3.81)	3.05	(3.25)	2.79	(2.86)	4.48	(4.30)	4.86	(3.74)	4.34	(3.87)
WFAGE	29.89	(5.65)	29.10	(6.27)	28.71	(5.59)	30.32	(4.98)	31.60	(6.65)	32.34	(5.55)	29.64	(5.46)
HEDUC	8.17	(3.69)	5.67	(3.53)	5.82	(4.27)	9.92	(4.09)	6.73	(3.86)	3.50	(1.26)	12.55	(2.73)
AWAY	.34	(.47)	.31	(.46)	.34	(.48)	.26	(.44)	.42	(.49)	.00	(.00)	.41	(.49)
N[a]	1409-1498		1358-1492		1736-1848		1263-1399		1667-1976		755-881		1090-1217	

	Husbands													
DAC	.36	(.48)	.28	(.45)	.40	(.49)	.24	(.43)	.20	(.40)	.26	(.44)	.36	(.48)
IFS	13.97	(3.52)	11.45	(3.54)	14.45	(2.91)	17.08	(2.78)	18.41	(2.61)	18.97	(2.87)	17.48	(3.90)
ACD	.58	(1.12)	.05	(1.87)	.70	(1.34)	-.06	(1.16)	.06	(1.01)	.31	(.85)	.48	(1.21)
LNLC	1.30	(.51)	1.18	(.48)	1.34	(.52)	1.16	(.43)	1.27	(.40)	1.15	(.48)	.97	(.41)
NLC	3.67	(2.04)	3.15	(1.85)	3.85	(2.16)	2.97	(1.45)	3.33	(1.45)	3.04	(1.72)	2.39	(1.30)
ROLD	2.72	(1.09)	3.05	(1.17)	3.19	(1.03)	2.70	(1.03)	2.98	(1.14)	2.93	(1.01)	2.81	(1.04)
AGFB	21.27	(3.73)	16.67	(4.92)	18.16	(3.61)	22.29	(3.76)	21.77	(3.33)	23.21	(4.06)	20.97	(4.40)
MDUR	9.80	(7.12)	13.10	(7.90)	13.27	(7.45)	8.66	(6.00)	11.73	(7.21)	10.65	(6.95)	10.79	(6.35)
PREVM	.04	(.19)	.07	(.26)	.23	(.42)	.04	(.20)	.03	(.18)	.01	(.09)	.14	(.34)
CLOSS	.21	(.41)	.37	(.48)	.39	(.49)	.16	(.36)	.13	(.33)	.04	(.20)	.05	(.21)
LBOY	.11	(1.60)	.06	(1.66)	-.00	(1.54)	.09	(1.62)	.14	(1.51)	.09	(1.66)	.02	(1.89)
LIMB	1.12	(1.15)	1.16	(1.18)	1.05	(1.13)	1.13	(1.17)	1.03	(1.12)	1.16	(1.19)	1.44	(1.22)
PINC	2.56	(.46)	1.72	(.43)	1.81	(.25)	2.02	(.26)	4.75	(1.18)	1.41	(.24)	12.02	(1.76)
CINC	2.43	(.74)	1.72	(.55)	1.74	(.33)	1.97	(.38)	4.95	(1.80)	1.40	(.37)	10.95	(3.54)
WEDUC	7.68	(3.42)	3.63	(3.56)	4.55	(3.76)	7.79	(3.91)	4.87	(3.00)	3.55	(1.30)	11.76	(3.19)
URBAN	.20	(.40)	.81	(.40)	.20	(.40)	.60	(.49)	.50	(.50)	.78	(.41)	.75	(.43)
MEDIA	6.30	(2.38)	8.30	(2.04)	5.62	(2.84)	8.29	(2.09)	7.00	(2.75)	8.51	(1.86)	8.99	(1.39)
CHYNG	2.13	(2.72)	4.14	(4.81)	3.05	(3.19)	2.88	(2.76)	4.50	(4.22)	4.64	(3.71)	4.25	(3.82)
WFAGE	29.39	(5.89)	29.42	(6.37)	28.68	(5.64)	30.59	(4.87)	31.60	(6.76)	32.40	(5.57)	29.77	(5.22)
HEDUC	8.13	(3.58)	5.86	(3.47)	5.96	(4.35)	9.37	(4.27)	6.85	(3.87)	3.00	(1.39)	12.55	(2.82)
AWAY	.39	(.49)	.33	(.47)	.34	(.47)	.29	(.45)	.41	(.49)	.00	(.00)	.43	(.50)
N[a]	321-335		318-470		857-898		383-440		845-917		372-447		303-346	

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[a] Because of missing data, not all means are based on the same number of cases. This line gives the minima and maxima.

in the Philippines, Turkey, and Indonesia, but this is only because a different transformation was used in these cases.

As one might expect, the U.S. respondents had the lowest mean number of children at the time of the interview. Korean respondents also had relatively few children and had been married, on the average, from a year and a half up to as much as five years less than the other groups. They were not any younger, however: mean ages across groups were quite close, and the Korean respondents were about average. The Philippine respondents had also been married a relatively short time. As should be expected, Korean respondents were relatively old when they first gave birth, but Singapore respondents were even older. At the other end of the distribution, Indonesian and Turkish respondents had been married the longest and had had their first births at the youngest mean age. These variations are consistent with variations in age at marriage: the singulate mean is slightly higher in Korea and Singapore than in the majority of these countries and clearly lower in Indonesia and probably in Turkey than in the other countries (Smith, 1978; Henry and Piotrow, 1979).

Variation across groups in times married and child loss might also be noted. Those married more than once were 17 to 23 percent in Indonesia and 13 to 14 percent in the United States; the next closest, at 5 to 7 percent, was Turkey. Child loss, on the other hand, showed a gradient from very high in Indonesia and Turkey (36 to 39 percent) and high in the Philippines (21 to 23 percent) to moderate in Korea and Taiwan (13 to 16 percent) and low in Singapore and the United States (4 to 5 percent).

Values and Disvalues of Children

Mean scores for the value and disvalue indices are given in Table 2. Variations in the parity-specific values and disvalues were analyzed in Bulatao (1981b) and will be discussed here only when comparisons with the general indices are useful. The general indices have not been presented before and deserve some attention. Means are given for these indices by country, sex, and parity. Because each is scaled differently, inferences about the relative importance of different values cannot be drawn from these indices (e.g., economic values cannot be compared with psychosocial values). For the same reason, differences between groups on one index are not necessarily comparable to differences on another index.

For most of the survey questions that go into these general indices, variations across countries and between the sexes have been discussed elsewhere (Bulatao, 1979a); variations in the indices are consistent with the patterns for their components. To summarize briefly, the perceived economic value of children is highest in the Philippines and Indonesia, followed by Turkey, Taiwan, Singapore, and Korea; the lowest economic value is found in the United States. The value of continuing the family name is strongest in Taiwan, Korea, and Singapore, as would be expected based on Sino-Confucian cultural influences. Husbands usually give greater importance to this dimension. The gender preference value, which measures a one-sided preference for either sex but not a preference for balance, is highest in Korea, Taiwan, and Turkey (where it reflects a preference for sons); mid-range scores are noted for the Philippines, Indonesia, and the United States; the lowest scores are for Singapore; a surprising result that may reflect the government's explicit campaign to eliminate gender preference as a factor in fertility decisions (Chung et al., 1981). No systematic differences between husbands and wives are shown. The companionship value of children is highest in the two most developed countries in the study—the United States and Singapore; middle-level scores are shown for Korea, Taiwan, and Turkey; at the bottom of this scale are the Philippines and Indonesia.

Among the disvalues, financial costs of children are given greatest weight in Korea, Singapore, and Indonesia; a moderate level of concern is expressed in the United States, Taiwan, and the Philippines; low concern is shown in Turkey. Husbands are nearly always more concerned than wives about the costs of children, presumably reflecting their responsibilities as family breadwinners. The measure of restrictions on freedom shows interesting patterns. Differences between the sexes are large. Among the groups expressing the greatest feeling of constraint, all are women (Turkey, the United States, Indonesia, Taiwan), except for males in the United States; the lowest-scoring groups are all males in countries with Sino-Confucian influence (Korea, Taiwan, Singapore). The higher scores for women presumably reflect their traditional childcare role. The high score for U.S. men may reflect the greater opportunities in that country for leisure activities involving couples without children. Interference with the wife's work is shown to be a relatively important disvalue in the Philippines, Turkey, and the United States; the lowest levels appear for Korea, Taiwan, and Singapore.

TABLE 2. Mean value and disvalue scores, by country and sex

	Philippines		Turkey		Indonesia		Korea		Taiwan		Singapore		United States	
Value or Disvalue	Wives	Husbs.	Wives	Husbs.	Wives	Husbs.	Wives	Husbs.	Wives	Husbs.	Wives	Husbs.	Wives	Husbs.
Parity-specific														
ECO	.12	.11	-.00	-.06	.16	.09	-.23	-.21	-.09	-.12	-.01	-.08	-.48	-.47
NAM	-.07	.10	.07	.26	.11	.07	.22	.18	.46	.46	.19	.30	-.27	-.14
GPR	-.01	-.00	.29	.28	-.13	-.01	.54	.49	.35	.33	-.13	-.12	.01	.00
COM	.11	.08	.15	.13	.18	.12	.12	.11	.09	.12	.26	.28	.53	.51
SIB	-.10	-.12	-.00	-.09	-.14	-.96	.19	.15	.02	-.01	.11	.11	.30	.22
FIN	.08	.16	.14	.10	.30	.36	.64	.69	.28	.35	.50	.60	.63	.56
FRE	-.12	-.15	.07	-.04	-.09	-.15	.02	-.13	.12	-.18	.01	-.30	.17	.14
WRK	.09	.08	.08	.09	-.01	-.06	-.32	-.48	-.31	-.57	-.46	-.57	.06	-.11
General, by number of living children[a]														
ECOV	2.56	2.53	2.32	2.24	2.57	2.50	2.15	2.07	2.21	2.15	2.20	2.10	1.64	1.62
0	2.45	2.36	2.22	2.22	2.50	2.55	1.93	1.71	2.00	1.97	1.98	1.78	1.64	1.52
1	2.50	2.51	2.20	2.04	2.49	2.52	2.04	1.92	2.06	1.96	2.08	1.95	1.56	1.59
2	2.54	2.50	2.23	2.16	2.54	2.50	2.09	2.04	2.11	2.04	2.09	2.00	1.64	1.66
3	2.55	2.54	2.34	2.26	2.59	2.50	2.18	2.08	2.21	2.16	2.19	2.12	1.70	1.63
4	2.57	2.50	2.44	2.37	2.58	2.50	2.26	2.15	2.30	2.53	2.35	2.26	1.72	1.70
5+	2.62	2.61	2.53	2.43	2.62	2.48	2.35	2.28	2.35	2.30	2.43	2.35	1.77	1.77

NAMV	1.63	1.81	1.71	2.03	1.77	1.80	2.11	2.06	2.39	2.44	1.96	2.06	1.20	1.36
0	1.66	1.81	1.79	1.98	1.71	1.79	2.14	2.30	2.24	2.20	1.64	1.58	1.24	1.33
1	1.62	1.80	1.67	2.18	1.76	1.87	2.14	1.86	2.31	2.46	1.75	1.87	1.12	1.30
2	1.65	1.83	1.70	2.08	1.72	1.77	2.08	1.93	2.31	2.28	1.81	1.90	1.22	1.34
3	1.63	1.80	1.70	2.00	1.73	1.73	2.06	2.12	2.38	2.43	1.99	2.03	1.22	1.43
4	1.61	1.77	1.73	1.99	1.77	1.80	2.15	2.14	2.44	2.44	2.16	2.26	1.30	1.56
5+	1.61	1.82	1.75	1.89	1.83	1.84	2.12	2.21	2.48	2.52	2.27	2.50	1.15	1.39
GPRV	3.86	3.88	4.03	4.02	3.78	3.85	4.19	4.16	4.09	4.08	3.75	3.73	3.83	3.86
0	3.88	4.01	3.98	3.98	3.98	3.93	3.96	4.09	4.11	4.07	3.87	3.82	3.82	3.92
1	3.93	3.93	4.12	4.13	3.94	3.96	4.16	4.14	4.11	4.10	3.85	3.88	3.80	3.78
2	3.91	3.94	4.04	4.05	3.91	3.96	4.29	4.23	4.45	4.09	3.75	3.73	3.83	3.83
3	3.88	3.90	4.07	4.00	3.80	3.88	4.26	4.22	4.08	4.09	3.70	3.71	3.92	3.91
4	3.85	3.79	3.95	3.92	3.78	3.85	4.14	4.09	4.08	4.04	3.73	3.73	3.85	3.88
5+	3.76	3.84	3.95	3.98	3.61	3.74	4.04	4.04	4.08	4.07	3.67	3.58	3.79	3.88
COMV	2.96	2.89	3.21	3.01	2.80	2.84	3.19	3.18	3.12	3.09	3.30	3.29	3.59	3.52
0	3.09	2.92	3.47	3.11	2.79	2.65	3.35	3.28	3.25	3.31	3.53	3.68	3.53	3.48
1	3.01	2.92	3.35	3.11	2.73	2.83	3.23	3.24	3.24	3.18	3.47	3.44	3.55	3.50
2	3.01	2.98	3.30	3.04	2.80	2.80	3.20	3.18	3.23	3.23	3.45	3.45	3.66	3.52
3	2.98	2.93	3.15	2.98	2.79	2.82	3.21	3.19	3.16	3.13	3.34	3.40	3.58	3.55
4	2.91	2.97	3.10	3.03	2.77	2.79	3.12	3.15	3.05	3.00	3.08	3.01	3.51	3.55
5+	2.91	2.75	2.93	2.82	2.86	2.88	3.08	3.05	2.93	2.90	2.98	2.89	3.58	3.55

TABLE 2. *(continued)*

Value or Disvalue	Philippines		Turkey		Indonesia		Korea		Taiwan		Singapore		United States	
	Wives	Husbs.	Wives	Husbs.	Wives	Husbs.	Wives	Husbs.	Wives	Husbs.	Wives	Husbs.	Wives	Husbs.
FIND	2.71	2.81	2.49	2.53	2.93	3.07	3.06	3.09	2.87	2.92	2.96	3.15	2.92	2.91
0	2.65	2.38	2.15	2.31	2.63	3.03	2.57	2.50	2.31	2.27	2.46	2.22	2.75	2.77
1	2.64	2.48	2.19	2.27	2.84	2.97	2.61	2.61	2.46	2.32	2.62	2.94	2.64	2.83
2	2.60	2.82	2.41	2.45	2.85	3.05	3.02	2.85	2.56	2.72	2.79	3.01	2.98	2.94
3	2.81	3.03	2.56	2.71	2.96	3.11	3.22	3.32	2.87	2.94	3.06	3.29	2.97	2.99
4	2.73	3.13	2.72	2.59	2.99	3.01	3.34	3.42	3.05	3.08	3.28	3.62	3.07	3.12
5+	2.77	2.76	2.91	2.81	3.02	3.12	3.33	3.47	3.27	3.37	3.33	3.31	3.09	2.93
FRED	2.29	2.18	2.69	2.18	2.56	2.13	2.36	1.92	2.52	1.78	2.47	1.72	2.66	2.65
0	2.16	2.09	2.72	2.39	2.38	2.07	2.35	2.33	2.62	1.61	2.66	2.01	3.11	3.11
1	2.29	2.12	2.78	2.33	2.46	2.09	2.43	2.20	2.50	1.88	2.43	1.70	2.66	2.59
2	2.30	2.18	2.64	2.11	2.52	2.08	2.41	1.91	2.55	1.86	2.47	1.75	2.61	2.62
3	2.26	2.18	2.68	2.25	2.61	2.09	2.27	1.80	2.53	1.78	2.55	1.64	2.50	2.52
4	2.26	2.16	2.64	2.10	2.65	2.18	2.29	1.76	2.50	1.71	2.46	1.74	2.38	2.12
5+	2.34	2.23	2.67	1.96	2.55	2.16	2.38	1.86	2.51	1.75	2.39	1.66	2.27	2.33
WRKD	2.91	2.93	2.69	2.91	2.82	2.77	2.59	2.47	2.55	2.34	2.51	2.42	2.91	2.75
0	2.78	2.88	2.90	2.90	2.75	2.77	2.74	2.57	2.44	2.26	2.64	2.54	3.00	2.72
1	2.90	2.85	2.92	3.02	2.77	2.72	2.67	2.54	2.49	2.30	2.69	2.50	2.97	2.75
2	2.91	2.88	2.89	2.90	2.83	2.85	2.57	2.44	2.51	2.32	2.50	2.40	2.87	2.76
3	2.94	3.00	2.87	2.86	2.79	2.77	2.58	2.47	2.57	2.36	2.51	2.44	2.85	2.77
4	2.91	2.97	2.89	2.90	2.87	2.80	2.56	2.49	2.55	2.36	2.42	2.32	2.81	2.77
5+	2.91	2.96	2.83	2.90	2.82	2.74	2.44	2.33	2.58	2.36	2.37	2.36	2.81	2.59

[a]The first line for each general value or disvalue gives the means across all parities.

Variations across parities in these general value indices require more careful attention. A straightforward interpretation would suggest that a higher rating for a value would be associated with higher fertility and a higher rating for a disvalue with lower fertility. However, this does not take into account variations in the availability of alternatives to children in providing specific values, or the clustering of particular values and disvalues and tradeoffs among them. In addition, a value or disvalue may affect preferred timing of births rather than intended parity progression. Means across parities will therefore be interpreted here as indicating the stages at which individual values and disvalues are more or less prominent, touching on their fertility impacts only indirectly.

The patterns across parities for these general value indices generally show agreement with the patterns for parity-specific values reported in Bulatao (1981b), though there are exceptions. Precise comparisons are not possible because the earlier study interpreted the patterns with regard to the specific values and disvalues that were most important at each parity, requiring comparisons among values and disvalues that are not possible here. One thing to keep in mind in reading Table 2 is that the earlier study related values to the next child, whereas the table gives values by number of living children, which is one number lower.

There is a clear trend in economic contributions (ECOV) across parities, with those having more children assigning greater importance to their economic contributions. This trend is consistent with the pattern for the parity-specific measure (Bulatao, 1981b) and with the earlier prediction that perceived economic benefits are related to high fertility preferences. There is no apparent trend in the relationship between family name and parity; in contrast to the parity-specific measure, family name (NAMV) does not stand out in relation to the first birth, except in a few cases. For gender preference (GPRV), peaks are apparent at low parities, generally at one or two children (referring, therefore, to having the second or third child); peaks for the parity-specific measure appeared more often in relation to the third and fourth child. Comparing companionship (COMV) scores across parities shows some tendency for scores to be higher at lower parities, as also shown by the parity-specific measure. This is consistent with the earlier prediction that psychosocial values would exert their influence at the early stages of family formation.

Financial costs (FIND) shows a fairly consistent increase across parity levels, as does the parity-specific measure. In most situations, there is of course a real increase in costs with each successive child, although the marginal costs tend to get smaller. The greatest difference in restrictions on freedom (FRED) was expected between no children and one child. A number of groups do show the highest concern about restrictions before the first child is born, but others show a higher level with one child; there is no clear trend beyond this parity. The data most consistent with the prediction are those for the United States (which has the largest sample of respondents with no children), where concern about restrictions declines substantially from no children to one child and continues to decline at successive parities. Restrictions on work (WRKD) does not show a consistent pattern across parities, although for some groups of women–in Korea, Singapore, and the United States–there is a definite decline. The prediction of a greater effect for this dimension early in the fertility career was not supported by either the parity-specific or the general indices.

Basic regressions for all parities combined

Two-stage least squares (2SLS) regression results for desire for another child and ideal family size are given in Table 3. (The reduced-form results appear in Appendix C.) For comparison, the results of logit regressions for desire for another child and ordinary least squares (OLS) regressions for ideal family size, in each case excluding the other measure from the set of predictors, are reported in Tables 4 and 5. The results are roughly similar across methods of estimation, though they differ in details; the 2SLS results will be discussed, with reference to the other results where appropriate.

Desire for Another Child

Desire for another child and ideal family size affect each other positively. Which effect is greater varies from case to case, but in most cases both effects are significant. The predictors of each are similar in some respects and different in others.

For the variables affecting desire for another child, the most significant effect is that of number of living children. LNLC is significant in each of the 14 regressions in Table 3; NLC is positive in each regression and significant in all but two cases. The logit results are largely similar, though a few effects are not significant. A typical case is Korean wives, for whom the coefficients for LNLC and NLC are about average. In this case, if the other variables are fixed at their means, the equation represents the proportion wanting another child as dropping from 94 percent of those with one child to 46 percent with two children to 18 percent with three, 9 percent with four, 6 percent with five, bottoming out at 5 percent with six to eight children, and rising slightly thereafter. At low and moderate parities, having an additional child makes one less likely to want to continue childbearing, but this does not hold at high parities.

Three other variables are related to the duration of the fertility career: the age of the oldest child, age at first birth, and marital duration. As expected, each of these three variables almost always has negative effects on the desire for another child. However, in both the 2SLS and logit regressions, these effects are significant only in some cases.

Of the two other experience variables, having been married more than once has significant positive effects among wives in Turkey and the United States in both the 2SLS and logit results, and also in a few other cases; having lost a child has no significant effects.

The family composition variables have various significant effects. Imbalance (LIMB) affects desire for another child positively, significantly in over half the cases, more often among wives than husbands. The proportion boys (LBOY), by contrast, has significant negative effects in Korea and Taiwan only. An unbalanced sex ratio in the family is overall a stronger predictor of the desire for another child than is a low proportion of sons.

Income and education have weak and inconsistent effects. The two significant effects for permanent income (PINC) are of opposite sign in the 2SLS results, as are the two significant effects for wife's education (WEDUC). More PINC effects are significant in the logit regressions, but all of these are inverse, contrary to the theoretical expectation. The logit results do show the effects of WEDUC to be negative with slightly greater consistency.

For the values and disvalues, the most consistent effects are for gender preference: its influence is positive and significant in the majority of cases. As expected, the other values usually affect the desire for another child positively. Few of these effects are significant, but sibling companionship does have significant effects in two cases. Of the disvalues, the only significant effects are for restrictions on freedom among U.S. wives. The logit results are roughly similar, in that

TABLE 3. Two-stage least squares regressions for desire for another child and ideal family size, by country and sex

Desire for Another Child: Wives

	Philippines		Turkey		Indonesia		Korea		Taiwan		Singapore		United States	
Predictor	B	(S.E.)	B	(S.E.)	B	(S.E.)	B	(S.E.)	B	(S.E.)	B	(S.E.)	B	(S.E.)
LNLC	-8.98**	(1.56)	-9.85**	(.79)	-10.42**	(1.16)	-10.94**	(1.14)	-10.53**	(.74)	-13.71**	(1.13)	-9.13**	(1.24)
NLC	.87**	(.21)	1.53**	(.23)	.57*	(.19)	1.76**	(.35)	1.53**	(.22)	1.89**	(.34)	1.70**	(.44)
ROLD	-.10	(.32)	-.20	(.27)	.31	(.31)	-.36	(.32)	-1.65**	(.25)	-.25	(.38)	-.44	(.32)
AGFB	-.03	(.03)	-.07	(.04)	.00	(.04)	-.12*	(.04)	-.10**	(.02)	-.06	(.04)	.02	(.05)
MDUR	-.01	(.05)	-.07	(.04)	-.12*	(.05)	-.09	(.05)	.10*	(.04)	-.11*	(.05)	-.19*	(.06)
PREVM	.50	(.76)	1.33*	(.47)	.70*	(.32)	-.60	(1.07)	1.04	(.55)	-.78	(1.55)	1.19*	(.39)
CLOSS	-.11	(.30)	-.29	(.24)	-.38	(.21)	-.07	(.31)	.16	(.20)	.26	(.58)	-.09	(.56)
LBOY	.05	(.07)	-.10	(.06)	-.06	(.06)	-.22*	(.06)	-.31**	(.05)	-.10	(.07)	.00	(.06)
LIMB	.54**	(.12)	.36*	(.11)	.14	(.11)	.47**	(.10)	.45**	(.08)	.41*	(.13)	.03	(.12)
PINC	-.65	(.33)	-1.24*	(.63)	1.90	(1.01)	-.51	(.82)	.12	(.10)	-.50	(.87)	.14	(.11)
WEDUC	.11*	(.05)	.03	(.06)	-.04	(.06)	-.00	(.05)	-.02	(.03)	-.16	(.14)	-.18*	(.09)
IFS	.76*	(.23)	.60*	(.29)	1.28**	(.32)	.80**	(.21)	.75**	(.16)	.94*	(.26)	.30	(.16)
ECO	.07	(.56)	.18	(.33)	.19	(.46)	.08	(.40)	.10	(.28)	-.75	(.42)	-.58	(.61)
NAM	.08	(.24)	.23	(.16)	.41	(.24)	.46*	(.17)	-.05	(.12)	.33	(.21)	-.62*	(.24)
GPR	.97**	(.24)	.49*	(.19)	1.12**	(.22)	.35*	(.17)	.42*	(.13)	.28	(.23)	.84**	(.21)
COM	-.21	(.49)	.47	(.32)	.04	(.51)	.06	(.39)	.21	(.24)	-.77	(.46)	.52	(.51)
SIB	.68*	(.26)	.24	(.20)	.34	(.24)	.41*	(.18)	-.02	(.14)	.08	(.25)	.18	[illegible]2)
FIN	.15	(.19)	.02	(.16)	.03	(.18)	-.34	(.17)	.08	(.14)	-.25	(.22)	-.08	(.16)
FRE	-.12	(.19)	.07	(.17)	-.21	(.18)	.02	(.15)	-.03	(.15)	.16	(.22)	-.64*	(.21)
WRK	-.13	(.22)	.01	(.14)	.29	(.20)	-.03	(.15)	-.19	(.11)	-.05	(.20)	.02	(.17)
Constant	2.59	(2.59)	6.86*	(3.32)	-6.29	(4.76)	.77	(4.21)	1.24	(2.98)	-1.01	(5.15)	6.23*	(2.63)
R^2 (F)	.32	(30.70)	.40	(40.73)	.41	(56.12)	.47	(53.71)	.54	(109.16)	.56	(43.51)	.39	(33.01)

Desire for Another Child: Husbands

LNLC	-4.38*	(1.82)	-7.22*	(2.35)	-11.16**	(1.53)	-10.43**	(2.26)	-12.66**	(1.06)	-12.64**	(1.75)	-13.86**	(3.14)
NLC	.11	(.40)	1.41*	(.49)	.68*	(.26)	1.61*	(.65)	2.15**	(.29)	1.75*	(.58)	1.69	(1.39)
ROLD	-.98*	(.43)	-1.75*	(.77)	.03	(.34)	-.61	(.59)	-1.12**	(.29)	-.72	(.43)	-.34	(.68)
AGFB	-.03	(.06)	-.15*	(.07)	-.10	(.05)	-.08	(.08)	-.04	(.03)	-.11	(.06)	-.07	(.12)
MDUR	.04	(.05)	.08	(.09)	-.06	(.04)	.03	(.11)	.04	(.04)	-.04	(.05)	-.03	(.10)
PREVM	-1.10	(1.23)	-1.65	(1.21)	1.03*	(.44)	-1.82	(1.22)	-.85	(.67)	2.71	(1.91)	-.12	(.89)
CLOSS	.83	(.60)	.07	(.71)	-.10	(.33)	-.52	(.62)	.53	(.30)	.33	(1.05)	.57	(1.38)
LBOY	.09	(.14)	-.31	(.17)	-.10	(.10)	-.36*	(.15)	-.30**	(.07)	-.05	(.11)	-.00	(.13)
LIMB	.96*	(.26)	-.15	(.33)	-.01	(.18)	.61*	(.22)	.43*	(.12)	.17	(.20)	-.14	(.29)
PINC	.13	(.63)	1.02	(1.07)	.91	(1.37)	-1.84	(1.35)	.29*	(.14)	.58	(1.14)	.03	(.25)
WEDUC	.04	(.08)	-.10	(.14)	-.10	(.09)	-.02	(.09)	-.06	(.05)	-.42	(.22)	.06	(.17)
IFS	.42	(.26)	-.44	(.54)	1.53**	(.35)	.87*	(.41)	.74**	(.19)	.53	(.28)	.94*	(.47)
ECO	.36	(1.02)	.28	(.95)	.49	(.70)	-.80	(.84)	-.20	(.44)	.34	(.75)	1.29	(1.46)
NAM	-.13	(.51)	.42	(.47)	.66	(.36)	-.42	(.37)	-.11	(.17)	.27	(.32)	-.56	(.53)
GPR	.97	(.51)	.76	(.57)	1.48**	(.35)	.54	(.35)	.37	(.21)	.63	(.33)	1.19*	(.54)
COM	.45	(1.00)	.06	(.93)	1.02	(.70)	.26	(.82)	-.04	(.35)	.31	(.78)	.27	(1.14)
SIB	.35	(.49)	.88	(.51)	.61	(.35)	.43	(.44)	-.28	(.23)	.09	(.38)	.17	(.52)
FIN	-.14	(.44)	-.22	(.40)	.16	(.28)	-.65	(.37)	-.16	(.20)	-.13	(.32)	-.32	(.34)
FRE	.11	(.44)	.15	(.45)	-.57	(.30)	.29	(.35)	-.03	(.16)	.03	(.33)	-.29	(.40)
WRK	-.12	(.46)	-.05	(.47)	-.14	(.28)	.23	(.39)	-.09	(.16)	-.05	(.36)	-.74	(.43)
Constant	4.18	(3.75)	17.14*	(6.02)	-4.94	(5.04)	1.34	(6.61)	-.57	(3.77)	7.34	(5.79)	-1.03	(6.99)
R^2 (F)	.47	(12.42)	.37	(6.37)	.38	(24.11)	.42	(12.11)	.53	(47.16)	.55	(18.28)	.34	(7.10)

TABLE 3. *(continued)*

	Ideal Family Size: Wives													
	Philippines		Turkey		Indonesia		Korea		Taiwan		Singapore		United States	
Predictor	B	(S.E.)	B	(S.E.)	B	(S.E.)	B	(S.E.)	B	(S.E.)	B	(S.E.)	B	(S.E.)
LNLC	4.08**	(.40)	2.40**	(.38)	4.85**	(.42)	2.90**	(.37)	2.79**	(.23)	5.07**	(.38)	5.61**	(.49)
AGFB	.06*	(.02)	.05*	(.02)	.01	(.02)	.03	(.02)	.04*	(.01)	.01	(.02)	.02	(.04)
MDUR	-.02	(.02)	.02	(.02)	.03*	(.02)	.05*	(.02)	.02	(.01)	.04*	(.02)	.05	(.04)
PREVM	.02	(.59)	-.44	(.41)	-.48*	(.17)	-.79	(.69)	-.24	(.36)	-.16	(1.04)	-1.31*	(.36)
CLOSS	.52*	(.20)	.37*	(.19)	.19	(.13)	.44*	(.20)	.08	(.13)	.17	(.40)	.38	(.53)
PINC	.28	(.27)	-.44	(.53)	-.32	(.71)	-.60	(.55)	-.10	(.07)	-.23	(.60)	-.02	(.11)
WEDUC	-.10*	(.04)	-.05	(.04)	-.01	(.04)	-.04	(.04)	-.02	(.02)	.14	(.10)	.04	(.08)
URBAN	-.74*	(.21)	.54*	(.22)	-.24	(.17)	.10	(.14)	-.42**	(.11)	-.28	(.20)	-.25	(.26)
MEDIA	-.00	(.04)	-.09*	(.04)	-.04	(.03)	-.02	(.03)	-.07*	(.02)	-.05	(.05)	.04	(.08)
DAC	.22*	(.08)	.22*	(.07)	.45**	(.08)	.24**	(.05)	.18**	(.03)	.33**	(.05)	.51**	(.10)
ECOV	.12	(.30)	-.22	(.28)	-.07	(.23)	.56*	(.24)	.63*	(.18)	.58*	(.24)	-.52	(.36)
NAMV	-.05	(.21)	-.17	(.16)	-.34*	(.15)	.19	(.11)	.20*	(.07)	.07	(.11)	.37	(.26)
GPRV	-.42	(.27)	-.01	(.23)	-.65*	(.26)	.30*	(.15)	.05	(.13)	-.04	(.22)	-.73*	(.31)
COMV	-.11	(.20)	-.36*	(.18)	-.30	(.16)	.62**	(.15)	-.24*	(.11)	-.05	(.19)	.52*	(.27)
FIND	-.27*	(.10)	-.20*	(.09)	-.15*	(.07)	-.15*	(.07)	-.07	(.05)	-.03	(.09)	-.30*	(.11)
FRED	-.18	(.13)	-.14	(.11)	-.04	(.10)	.03	(.07)	-.03	(.06)	-.35*	(.10)	-.59**	(.15)
WRKD	.25	(.17)	-.02	(.14)	-.22	(.13)	.03	(.12)	-.01	(.08)	.09	(.15)	-.31	(.19)
Constant	8.46**	(2.03)	9.87**	(2.06)	12.06**	(1.91)	9.31**	(1.65)	13.51**	(1.06)	11.88**	(1.92)	13.37**	(2.38)
R^2 (F)	.26	(28.12)	.15	(12.24)	.25	(32.17)	.23	(21.14)	.32	(50.27)	.49	(37.45)	.20	(15.50)

Ideal Family Size: Husbands

LNLC	5.30**	(.83)	2.64**	(.66)	3.10**	(.80)	.98	(.93)	2.24**	(.38)	5.58**	(.79)	6.84**	(.85)
AGFB	-.03	(.05)	.02	(.04)	.04	(.03)	.08	(.95)	.01	(.02)	-.03	(.04)	.08	(.06)
MDUR	.01	(.03)	.04	(.03)	.01	(.02)	.09*	(.04)	.01	(.02)	.03	(.03)	.03	(.05)
PREVM	.18	(1.03)	-.57	(.70)	-.50*	(.23)	.21	(.84)	.11	(.45)	.15	(1.44)	.10	(.69)
CLOSS	.22	(.50)	.54	(.42)	.12	(.19)	.07	(.43)	-.20	(.22)	1.10	(.71)	-.17	(1.07)
PINC	.26	(.61)	.69	(.66)	.27	(.91)	1.02	(1.01)	.01	(.11)	-.57	(.87)	-.08	(.18)
WEDUC	-.05	(.07)	-.13	(.07)	.02	(.05)	-.04	(.06)	-.02	(.04)	.14	(.17)	-.09	(.13)
URBAN	-.50	(.49)	-.50	(.48)	-.21	(.28)	-.06	(.32)	-.57*	(.17)	-.06	(.34)	.04	(.52)
MEDIA	-.15	(.09)	.04	(.11)	-.03	(.05)	-.13	(.09)	-.10*	(.03)	-.05	(.08)	-.03	(.16)
DAC	.49*	(.14)	.26*	(.12)	.20	(.14)	.09	(.11)	.07	(.05)	.41**	(.10)	.58**	(.12)
ECOV	.54	(.72)	.78	(.55)	.80	(.41)	.66	(.47)	.97*	(.27)	.86*	(.41)	-.95	(.61)
NAMV	-.29	(.44)	.30	(.29)	.24	(.24)	.50*	(.22)	.12	(.11)	.06	(.17)	.66	(.42)
GPRV	-.83	(.56)	.51	(.47)	-.08	(.47)	.11	(.38)	.44*	(.20)	-.05	(.32)	-.38	(.56)
COMV	.09	(.48)	.00	(.38)	.02	(.23)	.18	(.31)	-.08	(.18)	.03	(.33)	.58	(.50)
FIND	.36	(.24)	-.30	(.18)	-.10	(.12)	.27	(.16)	-.14	(.08)	-.30*	(.14)	.10	(.19)
FRED	-.50	(.26)	.10	(.22)	.29*	(.14)	.10	(.18)	-.17*	(.09)	-.25	(.18)	-.09	(.24)
WRKD	.10	(.37)	-.28	(.32)	.17	(.19)	.29	(.33)	.14	(.13)	-.42	(.31)	.64	(.39)
Constant	8.45	(4.45)	2.62	(3.88)	5.50*	(2.62)	7.31*	(3.23)	12.62**	(1.61)	13.19**	(3.12)	7.37	(4.58)
R^2 (F)	.28	(6.63)	.21	(3.48)	.17	(9.19)	.15	(3.54)	.25	(16.58)	.44	(14.03)	.30	(6.91)

*t significant at .05.
**t significant at .001.

TABLE 4. Logit regressions for desire for another child, by country and sex

	Wives													
	Philippines		Turkey		Indonesia		Korea		Taiwan		Singapore		United States	
Predictor	B	(S.E.)	B	(S.E.)	B	(S.E.)	B	(S.E.)	B	(S.E.)	B	(S.E.)	B	(S.E.)
LNLC	-2.82**	(.69)	-5.80**	(.71)	-4.14**	(.72)	-5.14**	(1.25)	-7.94**	(1.06)	-6.89**	(1.53)	-5.04**	(.83)
NLC	.28	(.17)	.99**	(.19)	.34	(.18)	.73	(.43)	1.49**	(.30)	1.16*	(.52)	1.17**	(.26)
ROLD	-.19	(.22)	.10	(.22)	-.21	(.19)	-.24	(.28)	-1.09*	(.33)	-1.00*	(.35)	-.22	(.21)
AGFB	.01	(.02)	.01	(.03)	-.04	(.03)	-.06	(.04)	-.03	(.03)	-.12*	(.04)	.02	(.03)
MDUR	-.01	(.04)	-.11*	(.04)	-.02	(.03)	-.11*	(.05)	-.06	(.06)	-.08	(.05)	-.13*	(.04)
PREVM	.52	(.53)	.94*	(.39)	.09	(.19)	-1.44	(1.42)	1.99*	(.69)	-27.50	(.22x10^6)	.50*	(.25)
CLOSS	.29	(.19)	-.11	(.22)	-.27	(.15)	.60	(.31)	.56	(.29)	1.70*	(.80)	.01	(.39)
LBOY	.01	(.04)	-.04	(.04)	.02	(.04)	-.17*	(.05)	-.23**	(.05)	-.08	(.07)	-.00	(.04)
LIMB	.24*	(.07)	.18*	(.09)	.06	(.07)	.25*	(.09)	.24*	(.08)	.25	(.14)	-.01	(.08)
PINC	-.56*	(.23)	-1.48*	(.57)	1.06	(.70)	-1.74*	(.81)	-.24*	(.12)	-1.38	(1.04)	.13	(.08)
WEDUC	.03	(.03)	-.03	(.05)	-.06	(.04)	-.02	(.05)	-.08	(.04)	-.13	(.17)	-.13*	(.06)
ECO	-.79*	(.34)	.18	(.31)	-.72*	(.29)	.12	(.38)	.72*	(.36)	-.17	(.48)	-.78*	(.38)
NAM	-.17	(.16)	.18	(.15)	-.05	(.17)	.40*	(.16)	.03	(.17)	.70*	(.25)	-.43*	(.17)
GPR	.79**	(.19)	.62*	(.16)	.98**	(.15)	.66**	(.17)	.83**	(.17)	.67*	(.27)	.51*	(.14)
COM	-.68*	(.33)	.28	(.29)	-1.10*	(.30)	.36	(.36)	.51	(.30)	-.96	(.57)	.37	(.35)
SIB	.41*	(.19)	.29	(.15)	.34*	(.17)	.51*	(.17)	.12	(.18)	.14	(.30)	.09	(.15)
FIN	-.01	(.13)	-.12	(.13)	.13	(.12)	-.43*	(.16)	.13	(.18)	-.12	(.27)	-.07	(.10)
FRE	-.18	(.13)	-.10	(.14)	-.13	(.13)	.06	(.15)	.07	(.19)	-.24	(.24)	-.53**	(.12)
WRK	-.02	(.15)	-.03	(.13)	.01	(.13)	.03	(.14)	-.23	(.14)	.13	(.23)	-.04	(.11)
Constant	2.92*	(.75)	5.08**	(1.27)	4.06*	(1.44)	7.87**	(1.59)	8.12**	(1.02)	10.99**	(2.00)	2.48*	(.95)
LR (df)	452.47	(19)	509.26	(19)	885.27	(19)	636.24	(19)	1069.58	(19)	464.88	(19)	437.90	(19)

	Husbands													
LNLC	-.79	(1.63)	-6.07*	(2.00)	-3.31*	(1.15)	-6.11*	(2.11)	-8.66**	(1.89)	-5.34*	(2.28)	-9.49**	(1.63)
NLC	-.33	(.46)	.85	(.50)	.06	(.30)	.87	(.66)	1.67*	(.58)	.48	(.78)	2.20**	(.46)
ROLD	-.62	(.33)	-1.03*	(.42)	-.38	(.21)	-.70	(.42)	-.98*	(.43)	-.98*	(.41)	.27	(.35)
AGFB	-.03	(.05)	-.17*	(.07)	-.07*	(.03)	.04	(.07)	.02	(.04)	-.09	(.05)	.06	(.05)
MDUR	.03	(.04)	.02	(.06)	-.02	(.03)	.10	(.08)	-.07	(.08)	-.04	(.06)	-.12*	(.06)
PREVM	-1.34	(1.41)	-1.17	(1.05)	.14	(.26)	-2.48	(1.47)	.30	(1.36)	3.57*	(1.63)	.16	(.56)
CLOSS	.96*	(.46)	-.36	(.61)	.08	(.22)	-.20	(.68)	.86	(.46)	1.91*	(.97)	.63	(.82)
LBOY	.09	(.10)	-.27*	(.13)	-.02	(.06)	-.18	(.11)	-.19*	(.07)	-.02	(.10)	-.02	(.08)
LIMB	.47*	(.16)	-.17	(.23)	.10	(.10)	.44*	(.18)	.07	(.12)	.06	(.18)	-.23	(.17)
PINC	.14	(.51)	.94	(.79)	.41	(.87)	-2.32	(1.29)	-.04	(.17)	1.74	(1.21)	-.13	(.13)
WEDUC	-.01	(.06)	-.05	(.10)	-.09	(.06)	-.06	(.08)	-.08	(.07)	-.65*	(.25)	-.03	(.10)
ECO	-.25	(.78)	-.24	(.80)	-.18	(.44)	-.80	(.74)	.52	(.56)	1.65*	(.76)	-.29	(.68)
NAM	-.14	(.42)	.36	(.39)	.28	(.24)	-.29	(.34)	-.21	(.24)	.44	(.34)	-.37	(.33)
GPR	.75	(.40)	.58	(.43)	1.03**	(.23)	.78*	(.32)	1.18**	(.27)	1.02*	(.36)	1.03*	(.32)
COM	.16	(.75)	-.48	(.79)	-.29	(.42)	-.33	(.74)	.35	(.44)	.95	(.83)	.77	(.66)
SIB	.28	(.38)	.90*	(.40)	.22	(.22)	.04	(.35)	.13	(.26)	.54	(.41)	.33	(.30)
FIN	.05	(.35)	.11	(.35)	-.21	(.16)	-.57	(.32)	-.24	(.27)	-.31	(.33)	-.28	(.21)
FRE	.05	(.31)	.15	(.38)	.05	(.17)	.22	(.34)	-.28	(.21)	-.04	(.33)	-.40	(.24)
WRK	-.33	(.32)	.01	(.40)	-.04	(.18)	.38	(.35)	.02	(.23)	.04	(.37)	-.17	(.23)
Constant	2.47	(1.52)	7.40*	(2.24)	5.85*	(1.75)	7.59*	(2.67)	6.35**	(1.39)	7.93*	(2.14)	4.16*	(1.85)
LR (df)	151.27	(19)	125.37	(19)	427.37.	(19)	186.15	(19)	468.48	(19)	206.08	(19)	121.57	(19)

*Likelihood ratio (LR) significant at .05.

**Likelihood ratio (LR) significant at .001.

TABLE 5. OLS regressions for ideal family size, by country and sex

	Wives													
	Philippines		Turkey		Indonesia		Korea		Taiwan		Singapore		United States	
Predictor	B	(S.E.)	B	(S.E.)	B	(S.E.)	B	(S.E.)	B	(S.E.)	B	(S.E.)	B	(S.E.)
LNLC	3.14**	(.24)	1.45**	(.26)	2.68**	(.16)	1.53**	(.24)	1.85**	(.16)	3.34**	(.27)	3.89**	(.36)
AGFB	.07*	(.02)	.04	(.02)	.00	(.02)	.01	(.02)	.03*	(.01)	-.03	(.02)	.04	(.04)
MDUR	-.02	(.02)	.00	(.02)	.00	(.01)	.03	(.02)	-.01	(.01)	-.00	(.02)	-.10*	(.03)
PREVM	.35	(.61)	.10	(.42)	-.42*	(.17)	-1.02	(.72)	.11	(.36)	-.43	(1.08)	-.71*	(.36)
CLOSS	.56*	(.21)	.25	(.19)	.05	(.13)	.53*	(.20)	.17	(.13)	.59	(.41)	.32	(.55)
PINC	.13	(.28)	-.86	(.53)	.98	(.67)	-.84	(.57)	-.14	(.07)	-.80	(.62)	.65	(.12)
WEDUC	-.08*	(.04)	-.06	(.04)	-.07	(.04)	-.04	(.04)	-.02	(.02)	.17	(.10)	-.04	(.09)
URBAN	-.82*	(.22)	.55*	(.23)	-.35*	(.17)	-.06	(.14)	-.48**	(.11)	-.42*	(.21)	-.07	(.27)
MEDIA	-.02	(.05)	-.09*	(.04)	-.02	(.03)	-.05	(.04)	-.08**	(.02)	-.12*	(.05)	.02	(.09)
ECOV	.23	(.31)	-.10	(.29)	.28	(.22)	.62*	(.25)	.74**	(.18)	.79*	(.25)	-.72	(.38)
NAMV	.00	(.22)	-.05	(.16)	-.41*	(.15)	.39*	(.10)	.23*	(.07)	.22	(.11)	-.02	(.26)
GPRV	.04	(.22)	.27	(.22)	.55*	(.15)	.51*	(.15)	.32*	(.12)	.47*	(.22)	-.02	(.29)
COMV	-.06	(.21)	-.36	(.19)	-.29	(.16)	.65**	(.16)	-.20	(.11)	-.09	(.20)	.58*	(.28)
FIND	-.31*	(.10)	-.25*	(.09)	-.15*	(.07)	-.22*	(.07)	-.08	(.05)	-.09	(.09)	-.31*	(.11)
FRED	-.28*	(.13)	-.17	(.12)	-.04	(.10)	.05	(.08)	-.02	(.06)	-.48**	(.10)	-1.00**	(.14)
WRKD	.24	(.18)	-.06	(.15)	-.26*	(.13)	.02	(.12)	-.05	(.09)	.08	(.15)	-.27	(.20)
Constant	8.75**	(2.13)	11.52**	(2.11)	9.91**	(1.88)	11.69**	(1.62)	14.49**	(1.09)	15.23**	(1.93)	17.27**	(2.39)
R^2 (F)	.24	(26.52)	.13	(11.54)	.24	(31.82)	.20	(19.76)	.29	(47.86)	.45	(34.07)	.17	(13.35)

	Husbands													
LNLC	2.91**	(.46)	1.37**	(.45)	1.97**	(.24)	.31	(.51)	2.09**	(.28)	2.67**	(.42)	3.81**	(.62)
AGFB	-.03	(.05)	-.02	(.03)	.01	(.03)	.06	(.04)	.01	(.03)	-.07*	(.03)	.06	(.06)
MDUR	-.01	(.04)	.00	(.03)	-.01	(.02)	.10*	(.04)	-.01	(.02)	-.00	(.03)	.00	(.04)
PREVM	-.18	(1.06)	-.50	(.72)	-.42	(.25)	.09	(.83)	.12	(.50)	2.43	(1.34)	-.12	(.69)
CLOSS	.55	(.49)	.14	(.40)	.07	(.20)	.10	(.42)	.08	(.25)	2.08*	(.67)	-.04	(1.09)
PINC	.53	(.62)	.66	(.67)	.44	(.96)	.97	(.99)	-.08	(.13)	.06	(.87)	-.17	(.17)
WEDUC	-.05	(.07)	-.13	(.07)	-.01	(.06)	-.06	(.06)	-.01	(.04)	-.08	(.17)	-.12	(.14)
URBAN	-.76	(.50)	.25	(.49)	-.34	(.28)	-.15	(.30)	-.55*	(.19)	.11	(.34)	.83	(.50)
MEDIA	-.18	(.10)	-.19	(.10)	-.02	(.05)	-.12	(.09)	-.11*	(.04)	-.01	(.08)	-.04	(.16)
ECOV	1.28	(.72)	.48	(.55)	1.11*	(.35)	.56	(.45)	1.11*	(.29)	1.40*	(.39)	-1.47*	(.61)
NAMV	-.17	(.46)	.53	(.28)	.35	(.23)	.53*	(.21)	.11	(.12)	.10	(.18)	.45	(.42)
GPRV	.35	(.47)	.68	(.45)	.43	(.25)	.27	(.34)	.47*	(.21)	.34	(.30)	.08	(.54)
COMV	.27	(.49)	-.00	(.37)	.13	(.24)	.24	(.30)	-.08	(.20)	-.25	(.32)	.52	(.50)
FIND	.05	(.23)	-.23	(.18)	-.19	(.11)	.23	(.15)	-.20*	(.09)	-.34*	(.14)	-.03	(.19)
FRED	-.46	(.27)	-.14	(.22)	.30*	(.15)	.16	(.17)	-.13	(.10)	-.41*	(.18)	-.39	(.23)
WRKD	-.15	(.38)	-.37	(.31)	.18	(.20)	.33	(.32)	.18	(.15)	-.46	(.31)	.35	(.39)
Constant	7.26	(4.57)	7.57*	(3.61)	5.25*	(2.62)	8.24*	(3.11)	13.22**	(1.79)	17.03**	(2.98)	15.64*	(4.44)
R^2(F)	.25	(5.91)	.11	(2.82)	.13	(7.63)	.14	(3.70)	.23	(16.30)	.41	(13.30)	.24	(5.47)

*t significant at .05.
**t significant at .001.

gender preference again has the most significant effects. Economic contributions of children does have a few more significant effects, but they are generally negative.

Ideal Family Size

Whereas desire for another child decreases with number of living children, ideal family size increases significantly with the log (LNLC) in every case but one. Adding a linear term (NLC) does not improve the prediction; the OLS results are similar. As previously observed, ideal family size rises with number of children, but not sufficiently to cover all the children in a large family.

Somewhat contrary to expectations, age at first birth has significant positive effects in a few cases; marital duration also has positive effects, again significant in a few cases.

Having been married more than once has some negative effects on ideal family size, significant for Indonesian and U.S. wives, contrasting with its occasional positive effects on desire for another child. Having lost a child has a positive effect on ideal family size, significant in a few cases (especially for Philippine and Korean wives); this contrasts with the absence of consistent effects on desire for another child.

Income and education have inconsistent and weak effects. Generally, PINC is positively related to ideal family size among wives, but the relationship is more often negative among husbands. The patterns are weakly consistent, with a more positive effect at lower levels of development and a more negative effect at higher levels. The effects of wife's education are predominantly negative, but they are significant only among Philippine wives. Urban residence and media exposure both generally depress ideal family size; these effects are significant in a few cases.

The values and disvalues of children have a more complex pattern of effects on ideal family size than on desire for another child. Economic contributions has significant positive effects in several regressions, especially in Taiwan, Singapore, and Korea. The other three values, including gender preference, are variable in their effects. Among the disvalues, financial costs is fairly consistently related to lower ideal family size, the effects being frequently significant among wives. Restrictions on freedom has significant negative effects among U.S. and Singapore wives; among husbands the effects are less consistent, being negative in Taiwan but positive in Indonesia. Restrictions on work, finally, has no significant effects and variable sign.

Regressions results with changes in predictors

This section examines the results obtained by replacing some measures in the previous regressions with measures of other variables. Given the weak and inconsistent results for permanent income, the current income measure (CINC) was tried in its place. However, as Table 6 shows, the results with CINC (when it was included with all the other predictors in Table 3) were also mostly insignificant, with inconsistent signs across groups. On ideal family size, CINC does not show the tendency noted for PINC of being more negative at higher levels of development. Replacing PINC with CINC also did not improve the results for wife's education.

Another substitute variable was wife's age (WFAGE), tried in place of marriage duration. In the same regressions (which also included the predictors from Table 3), three additional variables were added: the age of the youngest child (CHYNG), husband's education (HEDUC), and whether the wife was working away from the home (AWAY). The results for these specific variables only are presented in Table 7. The pattern of effects for WFAGE is roughly similar to that for marriage duration. It has a few significant effects: for desire for another child, there are some positive and negative effects; for ideal family size, positive effects, generally small, predominate. The other three variables added show inconsistent effects across countries, few of which are significant. None of the alternate or additional variables tested appears to significantly improve prediction of fertility intentions.

Regressions by subgroup

To determine the stability of the regression results, additional 2SLS regressions were run for subgroups. These were urban and rural residents for most country-sex groups. Given the special design of the Indonesian sample, the Indonesian subgroups were Javanese and Sundanese (this particular Javanese sample was less educated and poorer than the Sundanese sample [Darroch et al., 1981]); the subgroups for Singapore, which is essentially all urban, were ethnic Chinese and ethnic Malay.

The results for these subgroup regressions largely parallel those in Table 3. A majority of the significant effects in Table 3 are still significant in these regressions, or are of roughly the same magnitude but not significant because of smaller sample sizes. Table 8 provides only those results in which the coefficients for subgroups diverged from

TABLE 6. Effects of current household income and wife's education in 2SLS regressions for desire for another child and ideal family size, by country and sex

	Philippines		Turkey		Indonesia		Korea		Taiwan		Singapore		United States	
Predictor	B	(S.E.)	B	(S.E.)	B	(S.E.)	B	(S.E.)	B	(S.E.)	B	(S.E.)	B	(S.E.)
Desire for Another Child: Wives														
CINC	-.17	(.16)	-.16	(.19)	.22	(.40)	.06	(.29)	.07	(.05)	-.18	(.40)	-.04	(.04)
WEDUC	.06	(.04)	-.04	(.05)	.03	(.04)	-.04	(.04)	-.01	(.03)	-.21	(.12)	-.06	(.06)
R^2 (F)	.31	(31.21)	.41	(41.08)	.45	(67.86)	.45	(55.74)	.56	(102.93)	.54	(34.86)	.39	(34.95)
Desire for Another Child: Husbands														
CINC	.24	(.34)	.27	(.44)	1.97*	(.74)	1.14	(.77)	.19*	(.07)	-.04	(.59)	-.09	(.08)
WEDUC	.07	(.08)	-.04	(.09)	-.13*	(.06)	-.14*	(.06)	-.03	(.04)	-.33	(.18)	.13	(.17)
R^2 (F)	.46	(11.88)	.47	(9.93)	.35	(21.49)	.39	(12.71)	.53	(45.32)	.55	(16.74)	.36	(8.09)

	Ideal Family Size: Wives													
CINC	-.03	(.12)	-.06	(.17)	.14	(.28)	-.12	(.20)	-.05	(.03)	.10	(.27)	.03	(.04)
WEDUC	-.07*	(.03)	-.07*	(.03)	-.01	(.03)	-.06*	(.02)	-.04*	(.02)	.10	(.10)	.01	(.06)
R^2 (F)	.26	(28.40)	.15	(11.90)	.25	(32.50)	.21	(20.91)	.32	(44.48)	.47	(30.82)	.21	(17.12)
	Ideal Family Size: Husbands													
CINC	.08	(.30)	-.25	(.39)	-.82	(.47)	-1.04*	(.43)	-.06	(.05)	-.03	(.46)	.05	(.07)
WEDUC	-.09	(.06)	-.11	(.06)	.05	(.04)	.05	(.05)	-.01	(.03)	.10	(.14)	-.17	(.10)
R^2 (F)	.28	(6.50)	.24	(4.25)	.17	(9.48)	.17	(4.81)	.25	(15.70)	.43	(12.53)	.29	(7.17)

*t significant at .05.
**t significant at .001.

Note: All other variables in Table 3 are controlled, except permanent income (PINC).

TABLE 7. Effects of additional predictors in 2SLS regressions for desire for another child and ideal family size, by country and sex

	Philippines		Turkey		Indonesia		Korea		Taiwan		Singapore		United States	
Predictor	B	(S.E.)	B	(S.E.)	B	(S.E.)	B	(S.E.)	B	(S.E.)	B	(S.E.)	B	(S.E.)
Desire for Another Child: Wives														
WFAGE	-.09	(.11)	.02	(.06)	-.41**	(.09)	.16	(.11)	.33**	(.06)	-.18	(.18)	-.09	(.11)
CHYNG	.04	(.06)	-.06	(.04)	-.10	(.06)	-.09	(.06)	-.06	(.04)	.02	(.05)	.05	(.05)
HEDUC	.04	(.04)	.03	(.04)	-.04	(.05)	.05	(.05)	-.00	(.03)	.04	(.16)	-.02	(.07)
AWAY	.26	(.23)	.31	(.23)	.16	(.22)	.12	(.22)	.06	(.14)	--	--	-.21	(.27)
R^2 (F)	.32	(27.12)	.42	(39.19)	.42	(50.73)	.47	(46.88)	.55	(97.42)	.56	(38.73)	.39	(27.98)
Desire for Another Child: Husbands														
WFAGE	-.22	(.23)	.41*	(.16)	-.09	(.11)	.04	(.30)	.39**	(.10)	.07	(.23)	-.09	(.25)
CHYNG	.02	(.13)	-.08	(.09)	-.04	(.08)	-.04	(.14)	-.09	(.06)	-.10	(.08)	.11	(.17)
HEDUC	.04	(.09)	.08	(.11)	-.08	(.08)	.04	(.10)	-.01	(.04)	-.13	(.21)	-.11	(.14)
AWAY	.57	(.45)	-.04	(.57)	.39	(.34)	-.86	(.46)	.07	(.20)	--	--	.09	(.63)
R^2 (F)	.47	(10.97)	.43	(7.19)	.39	(21.89)	.41	(10.35)	.54	(42.98)	.55	(16.64)	.36	(6.61)

	Ideal Family Size: Wives													
WFAGE	-.01	(.03)	-.02	(.03)	.05*	(.02)	.02	(.03)	.00	(.02)	.03	(.03)	.13*	(.05)
CHYNG	-.06	(.04)	.08*	(.03)	-.07*	(.03)	.04	(.04)	.03	(.02)	-.01	(.04)	-.11*	(.05)
HEDUC	-.04	(.03)	-.06	(.03)	.01	(.03)	-.02	(.03)	-.03	(.02)	.05	(.11)	.06	(.06)
AWAY	-.13	(.17)	.44*	(.20)	.03	(.13)	.01	(.15)	-.09	(.09)	--	--	-.13	(.25)
R^2 (F)	.26	(23.99)	.15	(11.20)	.27	(30.67)	.22	(17.70)	.32	(43.31)	.49	(33.58)	.21	(13.69)
	Ideal Family Size: Husbands													
WFAGE	.12	(.08)	.00	(.06)	.00	(.03)	.10	(.08)	.02	(.03)	.01	(.06)	.20*	(.08)
CHYNG	-.07	(.11)	-.01	(.06)	-.04	(.04)	-.04	(.10)	-.02	(.04)	.05	(.06)	-.18	(.09)
HEDUC	-.04	(.08)	.01	(.08)	-.01	(.05)	.01	(.07)	.02	(.03)	.11	(.15)	.09	(.11)
AWAY	-.11	(.41)	.16	(.38)	-.20	(.20)	.11	(.33)	.08	(.15)	--	--	-.22	(.45)
R^2 (F)	.28	(5.52)	.20	(2.77)	.17	(8.17)	.14	(2.86)	.26	(14.43)	.44	(12.53)	.32	(6.46)

*t significant at .05.

**t significant at .001.

Note: All other variables in Table 3 are controlled, except marriage duration (MDUR).

those in Table 3: either the combined results (in Table 3) are significant, while the results for at least one subgroup are not significant and at least one standard error greater or less than the combined results; or the combined results are not significant, and the results for at least one subgroup are significant. These particular subgroup differences in Table 8 will now be discussed, first as regards the prediction of desire for another child and then as regards the prediction of ideal family size.

Desire for Another Child

Although the effects of number of living children (LNLC and NLC) on desire for another child are weaker for a couple of rural subgroups and for Singapore Malay wives, even in these cases the effects are in the same direction. The strong influence of number of living children is essentially confirmed.

The next three variables (ROLD, AGFB, and MDUR), which reflect the duration of the fertility career, were shown to have generally negative effects on desire for another child in Table 3, though few of the effects were significant. The subgroup results support this finding. A few of the significant results apply to only one or the other subgroup, but in most cases the effects of each variable are still negative. The notable exception is a significant positive effect of MDUR among Taiwan rural wives.

For having been married more than once (PREVM), one reversal of results is important: for Indonesian wives as well as husbands, the combined results are significantly positive, but the subgroup results are uniformly negative. The last experience variable, child loss, does have two significant effects in the subgroup regressions (there were none in Table 3), but in opposite directions.

The effects of gender composition (LBOY and LIMB) are generally consistent across subgroups, being slightly weaker only in the few cases shown in Table 8. The effects of LIMB seem to be weaker among rural (or Malay) respondents in the table, but this generalization does not hold across the other cases not shown.

As in the combined regressions, the effects of income and education are inconsistent for a few subgroups, where they may have opposite signs.

Results for the effects of ideal family size (which is endogenous in this system) on desire for another child indicate somewhat more diver-

TABLE 8. Differences between subgroup 2SLS regressions for desire for another child and ideal family size, by country and sex

Variable and Group	Desire for Another Child					
	Combined		Urban, Sundanese, or Chinese[a]		Rural, Javanese, or Malay[a]	
	B	(S.E.)	B	(S.E.)	B	(S.E.)
LNLC						
Singapore, Wives	-13.71**	(1.13)	-14.04**	(1.17)	-5.50	(4.32)
Turkey, Husbands	-7.22*	(2.35)	-8.09*	(2.60)	-3.26	(4.61)
Korea, Husbands	-10.43**	(2.26)	-13.44**	(2.58)	-5.23	(4.79)
NLC						
Turkey, Wives	1.53**	(.23)	1.71**	(.26)	.54	(.50)
Singapore, Wives	1.89**	(.34)	2.09**	(.42)	1.14	(.85)
Turkey, Husbands	1.41**	(.49)	1.17*	(.45)	.36	(1.22)
ROLD						
Korea, Wives	-.36	(.32)	-.89*	(.38)	.14	(.57)
Philippines, Husbands	-.98*	(.43)	-.50	(1.82)	-.91	(.47)
Taiwan, Husbands	-1.12**	(.29)	-.66	(.49)	-1.51**	(.37)
AGFB						
Turkey, Wives	-.07	(.04)	-.08*	(.04)	-.02	(.12)
Korea, Wives	-.12*	(.04)	-.19**	(.05)	-.00	(.07)
Taiwan, Husbands	-.15*	(.07)	-.12	(.07)	-.26	(.17)
MDUR						
Indonesia, Wives	-.12*	(.05)	-.17*	(.08)	-.06	(.05)
Korea, Wives	-.09	(.05)	-.00	(.06)	-.20*	(.09)
Turkey, Wives	-.10**	(.04)	.02	(.05)	.22**	(.06)
PREVM						
Indonesia, Wives	.70*	(.32)	-.66	(.52)	-.77*	(.36)
United States, Wives	1.19*	(.39)	1.16	(.44)	.79	(.90)
Indonesia, Husbands	1.03*	(.44)	-.76	(.55)	-.68	(.52)
CLOSS						
Indonesia, Wives	-.38	(.21)	.02	(.32)	-.83*	(.27)
United States, Wives	-.09	(.56)	-.79	(.63)	3.52*	(1.43)

TABLE 8. *(continued)*

Variable and Group	Combined		Urban, Sundanese, or Chinese[a]		Rural, Javanese, or Malay[a]	
	B	(S.E.)	B	(S.E.)	B	(S.E.)
LBOY						
Turkey, Wives	-.10	(.06)	-.13*	(.06)	.11	(.17)
Korea, Wives	-.22*	(.06)	-.12	(.08)	-.39*	(.11)
LIMB						
Singapore, Wives	.41*	(.13)	.57**	(.14)	.13	(.48)
Philippines, Husbands	.96*	(.26)	1.25	(.67)	.86*	(.30)
Taiwan, Husbands	.43*	(.12)	.56*	(.19)	.14	(.17)
PINC						
Turkey, Wives	-1.24*	(.63)	-1.36	(.78)	1.02	(1.88)
Indonesia, Wives	1.90	(1.01)	2.99*	(1.51)	-.35	(1.48)
Taiwan, Husbands	.29*	(.14)	.43	(.23)	-.13	(.19)
WEDUC						
Singapore, Husbands	.06	(.17)	-.48*	(.23)	-.29	(.86)
IFS						
Korea, Wives	.80**	(.21)	.36	(.28)	.99**	(.24)
Singapore, Wives	.94*	(.26)	.98*	(.27)	-.17	(.45)
United States, Wives	.30	(.16)	.40*	(.15)	-.08	(.36)
Turkey, Husbands	-.44	(.54)	.15	(.43)	.53*	(.24)
Taiwan, Husbands	.74**	(.19)	.93*	(.37)	.40	(.24)
United States, Husbands	.94*	(.47)	.27	(.30)	.26	(.23)
NAM						
Singapore, Wives	.33	(.21)	.47*	(.23)	-1.18	(.75)
Indonesia, Husbands	.66	(.36)	-.18	(.50)	1.49*	(.48)
GPR						
Philippines, Wives	.97**	(.24)	-.10	(.57)	1.25**	(.28)
Turkey, Wives	.49*	(.19)	.45	(.21)	.72	(.51)
Indonesia, Wives	1.12**	(.22)	.35	(.39)	1.62**	(.26)
Philippines, Husbands	.97	(.51)	.61	(1.38)	1.19*	(.58)
COM						
Singapore, Wives	.77	(.46)	-.30	(.50)	-5.76*	(1.88)

TABLE 8. *(continued)*

Variable and Group	Combined		Urban, Sundanese, or Chinese[a]		Rural, Javanese, or Malay[a]	
	B	(S.E.)	B	(S.E.)	B	(S.E.)
SIB						
Korea, Wives	.41*	(.18)	.11	(.22)	1.03*	(.32)
Turkey, Husbands	.88	(.51)	1.21*	(.44)	-.75	(1.15)
FIN						
Turkey, Husbands	-.22	(.40)	-.43	(.38)	1.51*	(.67)
Korea, Husbands	-.65	(.37)	-.06	(.39)	-2.12*	(.85)
WRK						
Taiwan, Wives	-.19	(.11)	-.02	(.15)	-.36*	(.16)
	Ideal Family Size					
LNLC						
Turkey, Wives	2.40**	(.38)	2.62**	(.41)	.95	(.76)
Korea, Husbands	.98	(.93)	3.27*	(1.22)	-.45	(1.34)
AGFB						
Turkey, Wives	.05**	(.02)	.06*	(.02)	.09	(.07)
MDUR						
Turkey, Wives	.02	(.02)	.02	(.02)	.14*	(.05)
Korea, Wives	.05*	(.02)	.02	(.02)	.10*	(.03)
Taiwan, Wives	.02	(.01)	.00	(.01)	.03*	(.01)
Singapore, Wives	.04*	(.02)	.04*	(.02)	.07	(.06)
United States, Wives	.05	(.04)	.02	(.05)	.16*	(.08)
Korea, Husbands	.09*	(.04)	-.01	(.05)	.22*	(.08)
PREVM						
Indonesia, Wives	-.48*	(.17)	.61*	(.22)	.56	(.29)
Indonesia, Husbands	-.50*	(.23)	.57	(.33)	.30	(.33)
CLOSS						
Turkey, Wives	.37*	(.19)	.11	(.21)	1.09*	(.46)
Indonesia, Wives	.19	(.13)	.04	(.18)	.48*	(.23)

TABLE 8. *(continued)*

Variable and Group	Combined		Urban, Sundanese, or Chinese^a		Rural, Javanese, or Malay^a	
	B	(S.E.)	B	(S.E.)	B	(S.E.)
PINC						
Turkey, Husbands	.69	(.66)	-.04	(.73)	4.79*	(1.81)
Singapore, Husbands	-.57	(.87)	-.95	(.98)	6.62*	(2.57)
WEDUC						
Philippines, Wives	-.10*	(.04)	-.04	(.07)	-.11*	(.04)
Turkey, Husbands	-.13	(.07)	-.07	(.08)	-.73*	(.29)
URBAN						
Singapore, Wives	-.28	(.20)	-.57*	(.20)	.60	(.81)
DAC						
Philippines, Wives	.22*	(.08)	.11	(.11)	.33*	(.09)
Indonesia, Husbands	.20	(.14)	.27*	(.12)	.29	(.20)
Korea, Husbands	.09	(.11)	.26*	(.13)	.16	(.16)
Singapore, Husbands	.41**	(.10)	.40*	(.11)	.04	(.18)
ECOV						
Singapore, Wives	.58*	(.24)	.20	(.25)	1.01	(.107)
NAMV						
Taiwan, Wives	.20*	(.07)	.09	(.09)	.31*	(.10)
Korea, Husbands	.50*	(.22)	.58*	(.25)	.27	(.44)
United States, Husbands	.66	(.42)	1.35*	(.52)	-.25	(.86)
GPRV						
Philippines, Wives	-.42	(.27)	-.22	(.49)	-.75*	(.31)
Indonesia, Wives	-.65*	(.26)	.16	(.28)	-1.53*	(.45)
COMV						
Turkey, Wives	-.36*	(.18)	-.44*	(.19)	.17	(.47)
Indonesia, Wives	-.30	(.16)	-.50*	(.21)	-.06	(.25)
United States, Husbands	.58	(.50)	.28	(.55)	2.85*	(1.16)

TABLE 8. *(continued)*

Variable and Group	Combined		Urban, Sundanese, or Chinese[a]		Rural, Javanese, or Malay[a]	
	B	(S.E.)	B	(S.E.)	B	(S.E.)
FIND						
Turkey, Wives	-.20*	(.09)	-.25*	(.10)	.15	(.23)
Indonesia, Wives	-.15*	(.07)	-.06	(.10)	-.20	(.11)
Philippines, Husbands	.36	(.24)	2.15*	(.91)	.16	(.24)
Singapore, Husbands	-.30*	(.14)	-.22	(.17)	.33	(.60)
FRED						
Philippines, Wives	-.18	(.13)	-.70*	(.26)	-.04	(.14)
Singapore, Wives	-.35*	(.10)	-.14	(.11)	-.30	(.35)
United States, Wives	-.59**	(.15)	-.87**	(.19)	.17	(.26)
Singapore, Husbands	-.25	(.18)	.01	(.20)	-1.25*	(.52)
WRKD						
United States, Husbands	.64	(.39)	-.03	(.46)	2.11*	(.79)

Note: This table gives coefficients only for those cases where the subgroup results differ from the combined results in either of two ways: either the combined results are significant and the results for at least one subgroup are nonsignificant and at least one standard deviation away from the combined results, or the combined results are not significant and either of the subgroup results are significant.

*t significant at .05.
**t significant at .001.

[a] The Indonesian subgroups are Sundanese and Javanese; the Singapore subgroups are Chinese and Malay; subgroups in all the other cases are urban and rural.

gence between subgroups than exists for other variables. There are two cases where the coefficient is negative, though negligible; on the other hand, in the only case where the combined coefficient is negative, both subgroup coefficients are positive and one of them is significant. Thus the subgroup results indicate variability in the strength of these effects, but confirm that they are positive.

Like the results for other variables, the subgroup results for values and disvalues are generally consistent with the combined results, though there are exceptions. For family name, for instance, Table 3 shows one significant positive and one significant negative result. Table 8 is consistent in showing that the sign for this variable is sometimes negative and sometimes positive, though the two significant effects shown are both positive. The results for gender preference do require further comment. Table 8 suggests a slight tendency for the impact of this variable to be more strongly positive among rural residents, though it is also generally positive for urban residents. However, the other cases not shown are evenly divided between those where the effects are greater for urban residents and those where the effects are greater for rural residents, and the differences are typically small.

Ideal Family Size

For ideal family size, the regression results are also generally similar between subgroups. Table 8 notes the exceptions. It shows only two cases where the effects of number of living children (LNLC) are appreciably weaker than in the combined regressions. It also shows one case where the effects of age at first birth (AGFB) differ, not being significant for one subgroup only because of a smaller sample size.

There is greater variation in the effects of marriage duration (MDUR), which are significantly positive for several rural subgroups despite the combined nonsignificant results. There is some tendency for these effects to be stronger among rural residents (but not in the Philippines), Indonesian Javanese, and Singapore Malays.

As was the case in the prediction of desire for another child, having been married more than once has unexpected results for the Indonesian subgroups, among wives as well as husbands: whereas the combined results are negative and significant, all the subgroup results are positive, and one is significant.

For child loss, two subgroup differences are noted in Table 8: this variable has greater impact among rural than urban Turkish wives and among Javanese than Sundanese Indonesian wives. This impact is also more strongly positive among rural than urban Philippine wives and among rural than urban Turkish husbands, though in neither case did the differences meet the criteria for inclusion in the table.

For the income and education measures, the cases listed in Table 8 suggest that both variables may have more consistent results among rural than urban residents. For a couple of other cases not listed, the effects of PINC are more strongly positive and the effects of WEDUC more strongly negative among rural than urban residents; however, this is true overall in fewer than half the comparisons.

Urban residence was used only in the subgroup regressions for Indonesia and Singapore, where one instance of differential effects is noted. For media exposure, no differential effects are noted.

Desire for another child shows stronger or more significant effects in some subgroups and weaker effects in others, but the coefficients are consistently positive.

The four general value indices show some differences in effects between subgroups, but not consistent ones. The effects of economic contributions (ECOV) essentially do not vary. The other values have scattered effects in the combined regressions; subgroup differences are similarly scattered and do not indicate any consistent pattern.

For the three disvalues, some patterns do appear. Financial costs (FIND), which generally had negative effects in the combined regressions, has slightly stronger negative effects among urban than rural residents where wives are concerned; only Singapore and the United States are exceptions. However, among husbands this generalization does not hold. In the combined regressions, FRED was important in reducing ideal family size mainly in Singapore and the United States; it seems to be more important among Singapore Malays than Chinese and among U.S. urban than rural residents. Work restrictions (WRKD), not significant in any of the combined regressions, significantly increased ideal family size among U.S. rural husbands.

In summary, the subgroup regressions suggest few consistent differentials between groups across countries. This may be partly due to differences in the way subgroups are defined, in some cases by residence and in others by ethnic affiliation; even where residence is the criterion, there are variations in the definition of urban and rural areas that could make consistent results difficult to obtain. The results have been interpreted with a view to identifying cross-national variations. It is also possible to interpret the results for each country individually in relation to country-specific circumstances, but this is not attempted here.

The subgroup regressions largely reinforce the combined results. Of the variations from these results, the following may be highlighted: (1) the reversal of the impact of having a previous marriage in Indonesia; (2) the variability in the strength of the influence of ideal family size on desire for another child, though this influence is consistently positive; (3) a slightly stronger link between marriage duration and ideal family size among rural than urban residents; and (4) a somewhat stronger negative impact of perceived financial costs on ideal family size among urban than rural wives (but somewhat more consistent results for income and education among a few rural subgroups).

Regressions to predict recent childbearing

The regression results for desire for another child may also be compared with results from regressions to predict recent childbearing. The important predictors should be similar since desire for another child is in theory a major reason for having one. However, results should not be expected to be identical: recent fertility also involves such supply factors as a couple's fecundity and their use of fertility-regulation methods, including method availability and cost, that usually do not enter into the determination of fertility desires (McClelland, 1983). In addition, of course, recent fertility reflects conditions in an earlier period during which the structure of incentives and disincentives for childbearing may have been different.

The measure of recent fertility used was whether a child had been born within the two years preceding the interview. As noted earlier, only live births were counted, and children who had died since birth could not be included. This introduces possible biases, but different ones from those involved in the analysis of fertility intentions, and may therefore make the results less comparable.

The measures used to predict recent fertility were also more limited than those used in the earlier regressions. The value and disvalue measures could not be used because they reflected conditions at the time of the interview rather than those two years previously. In addition, the family composition measures used to test the impact of gender preference could not be used because the sex of the last child was not determined. Except for PINC and WEDUC, the remaining predictors were adjusted for conditions two years previously.

Table 9 presents the results of the logit regressions for having had a child in the past two years. Despite the limitations of this analysis, results are parallel though not identical to those in the regressions for desire for another child. In a typical case (Taiwanese wives), the equation indicates that the proportion having another child in the period goes from 0.48 of those who started with one child to 0.28 at two

TABLE 9. Logit regressions for having had a child in the last two years, by country and sex

Predictor	Philippines B	(S.E.)	Turkey B	(S.E.)	Indonesia B	(S.E.)	Korea B	(S.E.)	Taiwan B	(S.E.)	Singapore B	(S.E.)	United States B	(S.E.)
Wives														
LNLC	.48	(1.03)	-.97	(.93)	-1.28	(.94)	-3.42*	(1.20)	-1.81	(1.12)	.05	(1.53)	-5.82**	(1.35)
NLC	-.32	(.36)	.09	(.35)	.52	(.34)	.83	(.45)	.41	(.40)	-.54	(.63)	1.89*	(.53)
ROLD	-.20	(.16)	-.26	(.18)	-.18	(.13)	-.50*	(.24)	-.74*	(.26)	-.33	(.26)	.19	(.20)
AGFB	-.03	(.02)	.00	(.03)	-.00	(.02)	.00	(.03)	-.02	(.02)	-.01	(.03)	.02	(.03)
MDUR	-.05	(.03)	-.06	(.03)	-.07*	(.02)	-.07	(.04)	-.12*	(.05)	-.12*	(.05)	-.15*	(.04)
PINC	-.75**	(.18)	-.93*	(.42)	.82	(.53)	-1.56*	(.65)	-.22*	(.09)	-2.37*	(.93)	-.10	(.08)
WEDUC	.04	(.08)	-.06	(.04)	-.02	(.03)	-.01	(.04)	-.04	(.03)	.04	(.14)	-.02	(.06)
Constant	3.48**	(.58)	2.82*	(.94)	-.96	(1.03)	5.35**	(1.26)	4.47**	(.68)	4.59*	(1.47)	1.53	(.88)
LR (df)	109.61	(7)	129.84	(7)	102.31	(7)	253.54	(7)	602.64	(7)	121.60	(7)	121.50	(7)
Husbands														
LNLC	-.52	(1.68)	1.34	(1.85)	-1.86	(1.38)	-4.72*	(2.35)	-1.77	(1.59)	1.41	(2.48)	-6.58*	(2.54)
NLC	-.04	(.64)	-.87	(.73)	.74	(.49)	1.31	(.89)	.30	(.58)	-1.18	(.99)	2.07*	(.99)
ROLD	-.35	(.24)	-.04	(.34)	-.60*	(.16)	-1.01*	(.40)	-1.02*	(.26)	-.59	(.33)	-.24	(.36)
AGFB	-.03	(.04)	-.00	(.05)	-.06*	(.03)	-.11*	(.06)	.00	(.03)	-.00	(.04)	-.06	(.05)
MDUR	-.01	(.03)	-.08	(.05)	-.01	(.02)	.01	(.06)	-.04	(.04)	-.01	(.05)	-.06	(.06)
PIN	-.75*	(.37)	-.42	(.51)	.53	(.66)	-.43	(.94)	-.07	(.13)	-1.77	(1.00)	-.02	(.14)
WEDUC	-.05	(.05)	-.08	(.07)	.01	(.04)	-.08	(.07)	-.07	(.05)	.13	(.20)	-.07	(.11)
Constant	4.45*	(1.21)	1.72	(1.43)	1.12	(1.26)	7.12*	(2.09)	3.53*	(.94)	3.29*	(1.53)	3.48*	(1.67)
LR (df)	29.62	(7)	30.83	(7)	57.69	(7)	68.16	(7)	273.81	(7)	64.84	(7)	43.25	(7)

Note: The independent variables in this table have been adjusted to reflect conditions two years prior to the interview.

*Likelihood ratio (LR) significant at .05.
**Likelihood ratio (LR) significant at .001.

children to 0.22 at three children, reaching its lowest point of 0.20 at four children and rising gradually beyond that. There is some variation across countries, however, and the coefficients for living children are only occasionally significant. Effects in these regressions appear to be weaker than those in Table 3, as might be expected given the earlier caveats.

The three duration variables, reflecting age of the oldest child, age at first birth, and marriage duration, generally have negative effects, occasionally significant, on having had a child. These are similar to their effects on desire for another child. In contrast to the results with fertility intentions, the effects of these variables, as well as those of number of living children, may partly reflect the decline of fecundity with age.

Most of the time, permanent income relates negatively to having had a child, and its effects are significant in almost half the cases. The effects of wife's education are also usually negative, but are typically small. The effects of education are similar to its effects on desire for another child, but the income effects are not: in Table 3, the sign of the latter was positive slightly more often than negative, though it was seldom significant.

Regressions by number of living children

The combined regressions were rerun adding interaction terms with number of living children. In roughly half the cases–more often for desire for another child than for ideal family size–the interaction terms did add significantly to the variance explained. Therefore, regressions were run for subgroups defined by number of living children. It should be noted that the subgroups with larger numbers of children are in a sense progressively selective, including only those who, for whatever reason, reach higher parities. Subgroups with fewer children, on the other hand, may include some who would stop at small families and some who would eventually have larger families. This must be taken into account in interpreting results. Also, subgroups were defined without reference to child mortality (though the child loss variable is included in the regressions). For convenience, these will nevertheless be referred to as parity-specific regressions.

The regressions for respondents with no children excluded several variables that are defined only among those with at least one child. Similarly, one gender composition variable, LIMB, was excluded from regressions for those with one child. Some regressions could not be run because of lack of variance in the dependent variable (especially at no children, where desire for another child is most often positive) or because of the small number of cases. Some variables (having a previous marriage, for instance) were also left out of particular regressions because they lack variance in the specific group.

The parity-specific results, which are quite voluminous, are given in full in Appendix D. For those variables that show interesting results, median regression coefficients across countries (for wives and husbands separately) and quartiles (for both sexes combined) are diagrammed in Figure 3, for desire for another child, and Figure 4, for ideal family size. However, the discussion here focuses not only on these summary figures but also on specific differences between countries.

Desire for Another Child

The effects on desire for another child in Figure 3 show considerable variability; no identifiable pattern appears to be without at least one exception. Nevertheless, it is these patterns that require attention. The effects of age and experience may be considered first. As in Table 3, the age of the oldest child is significant mainly in Taiwan, at several parities. However, neither in Taiwan nor in the other countries is there any pattern to these effects across parities. Similarly, for age at first birth, no pattern in the effects across parities is evident. For those with one living child, marriage duration (Figure 3a) most often has significant negative effects among wives. Among husbands, the negative effects are stronger at two children relative to the other parities, but this pattern is not entirely consistent.

Having been married more than once has effects of variable sign; in absolute terms, the coefficients seem to be largest at one and two children among wives and at four among husbands (but this variable was left out in several regressions for the latter because of a lack of variance). Having lost a child has variable effects: its largest positive coefficient is at two children in Singapore, but at different parities elsewhere.

As noted earlier, the proportion boys (LBOY, in Figure 3b) has significant negative effects on desire for another child mainly in Korea and Taiwan. In these countries, as well as in Singapore, Turkey, and Indonesia, it generally has the largest effects at either three or four

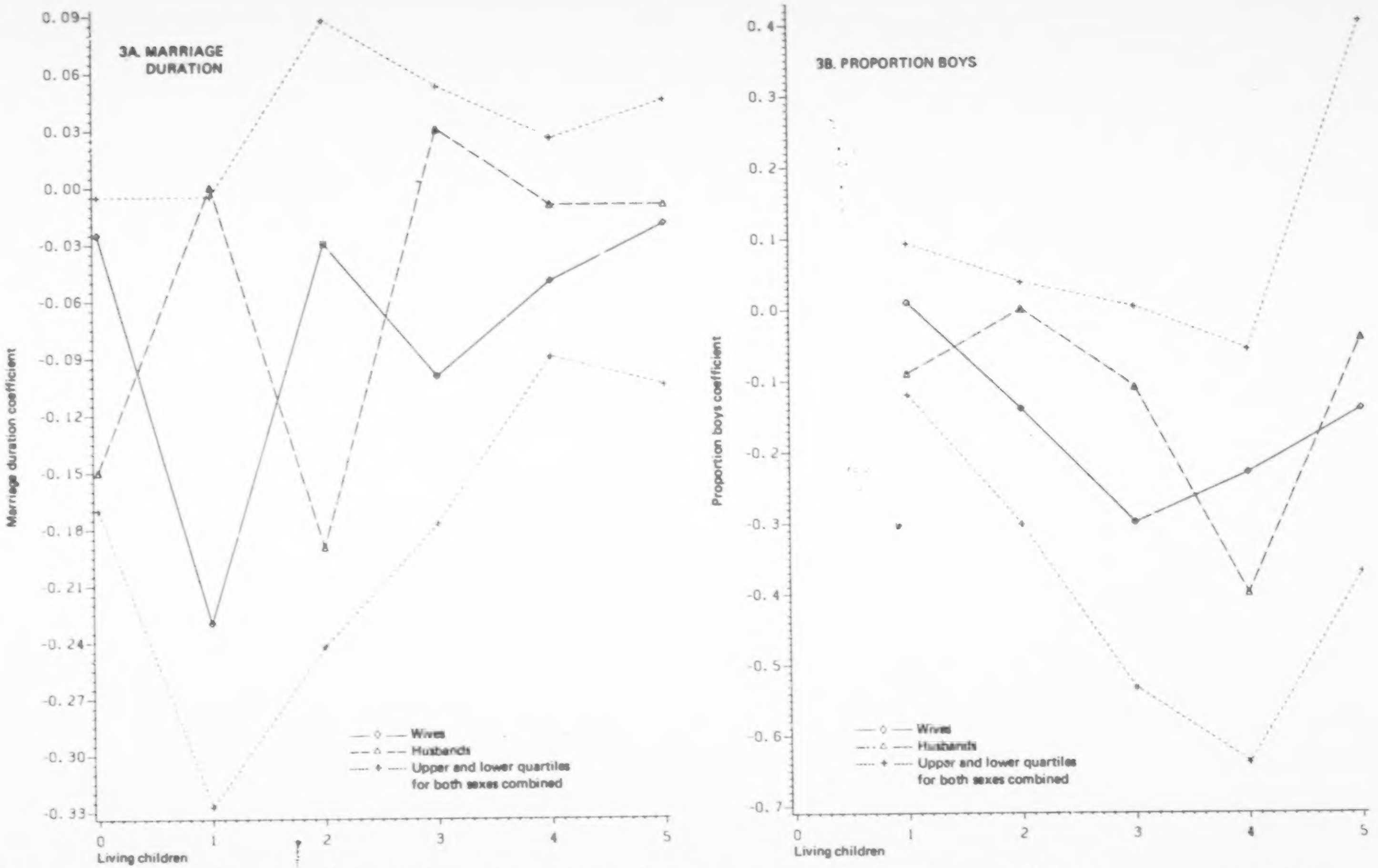


FIGURE 3. Regression coefficients for selected predictors of desire for another child, by sex and number of living children

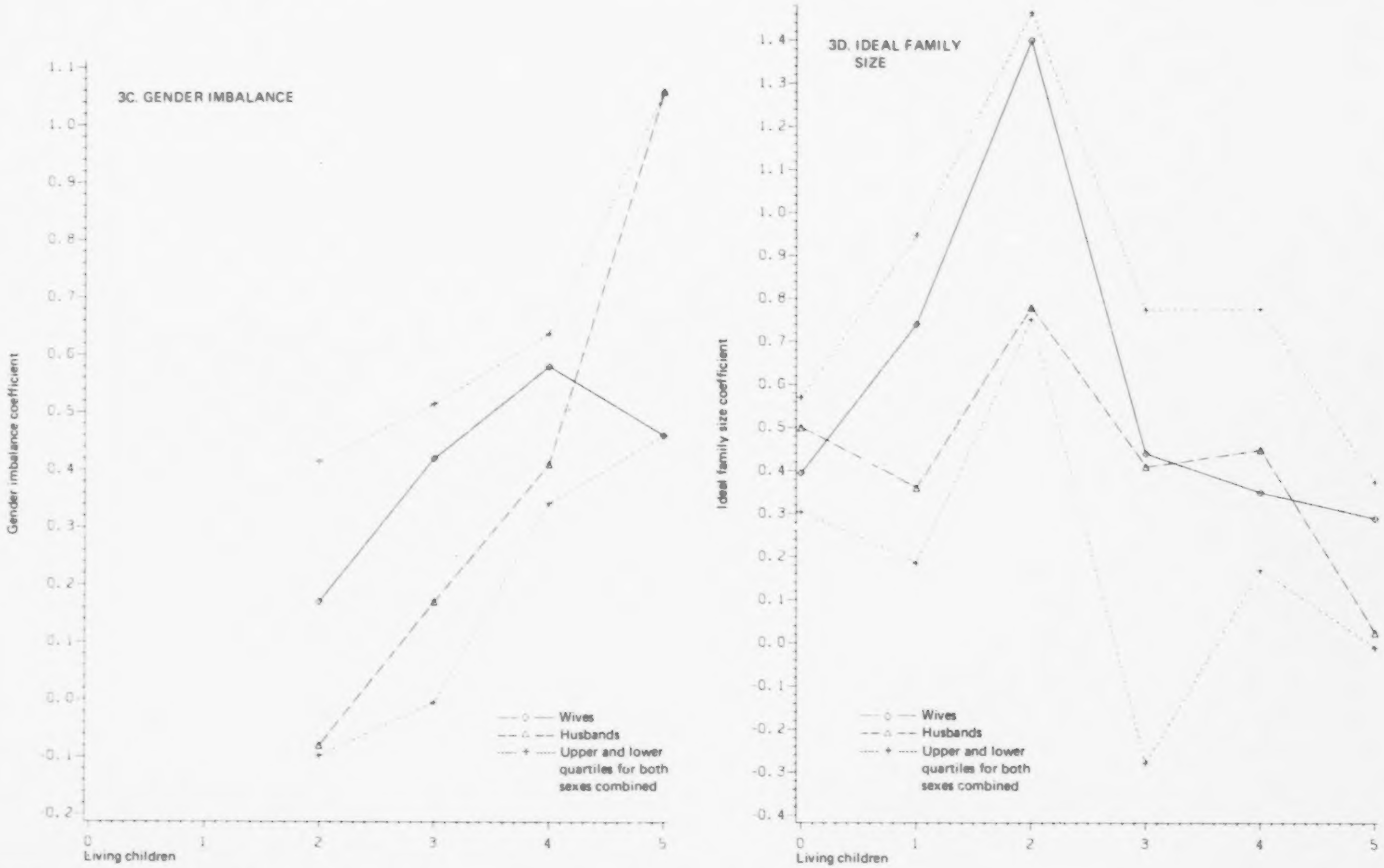


FIGURE 3. *(continued)*

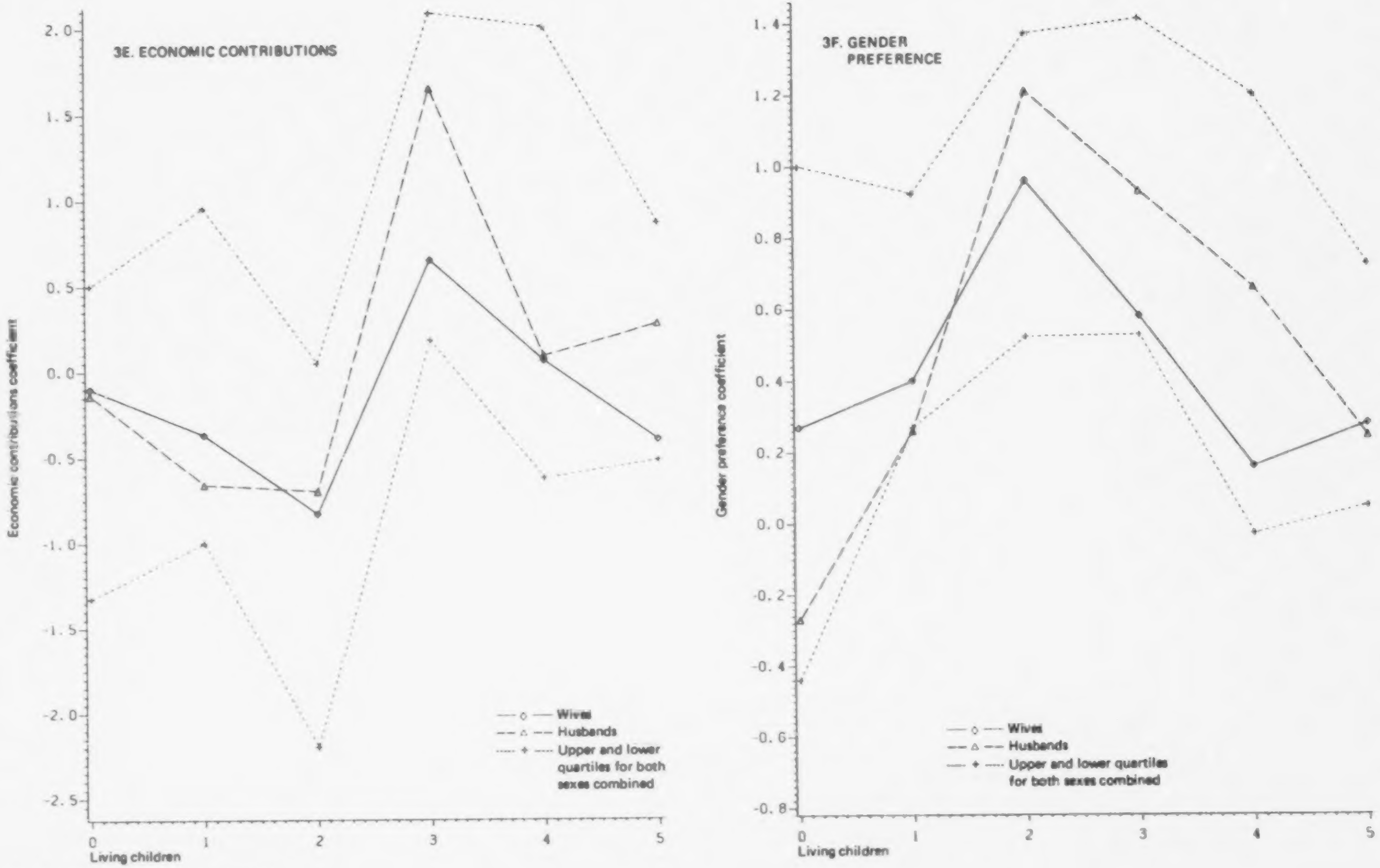


FIGURE 3. *(continued)*

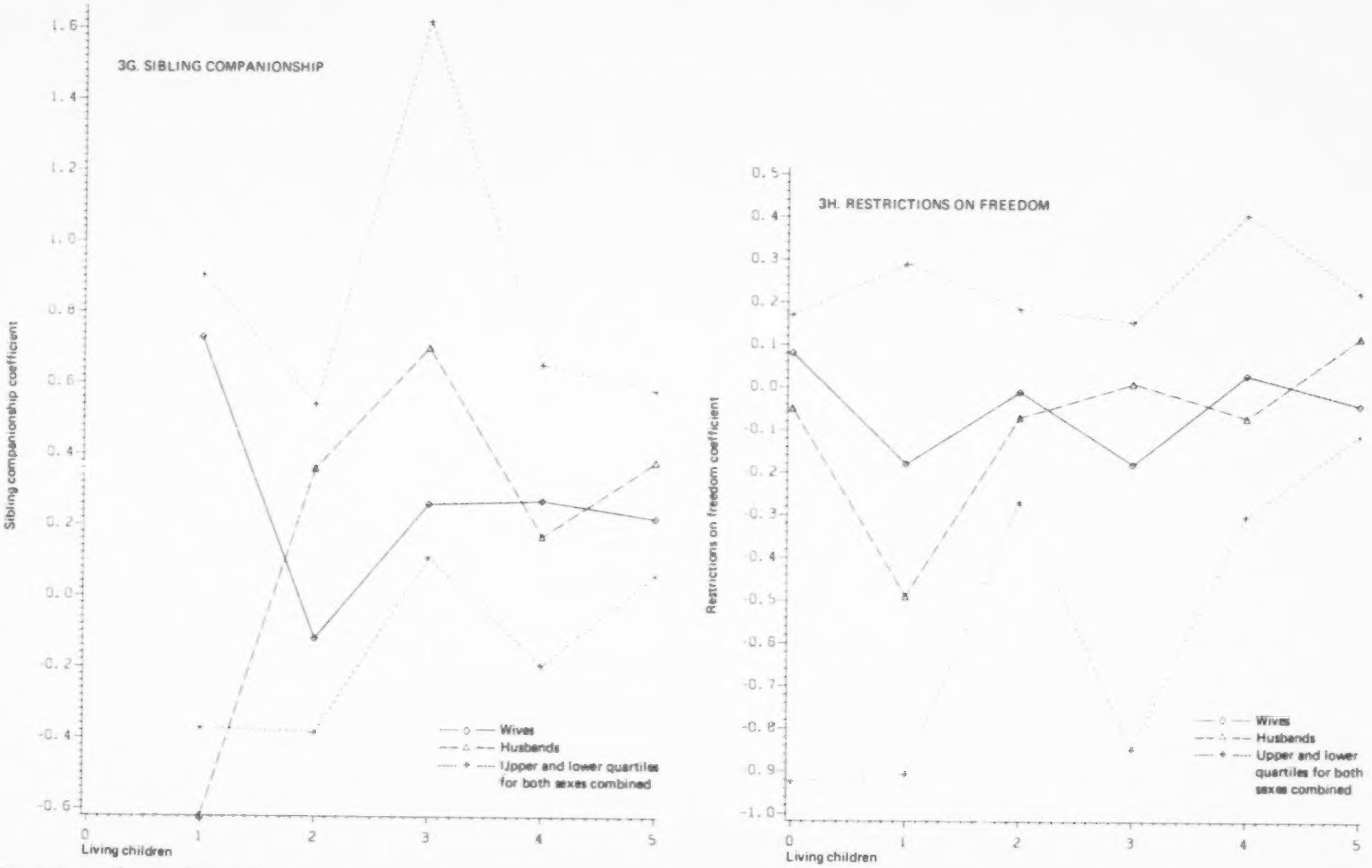


FIGURE 3. *(continued)*

children. Gender imbalance (LIMB, in Figure 3c), on the other hand, leads to an increase in desire for another child in most countries. Overall, its effects seem to be slightly stronger at the higher parities, particularly at four children among wives and at five or more children among husbands.

For income, the pattern observed in previous studies was positive effects at low parities and negative effects at high parities. Such a pattern does appear for permanent income among U.S. wives; for Indonesian and Taiwanese husbands, the pattern is arguably similar, though not marked. The other cases do not substantiate this pattern, however. For instance, for Korean and U.S. husbands, the stronger effects seem to be at higher parities. For education, the effects observed in other studies were more negative at lower parities. Again, the results for U.S. wives seem generally confirmatory, but are not supported by the results in other groups (except possibly Indonesian husbands). For most of these groups, the effects of education vary, with no linear pattern, or, in the case of Philippine wives, move from more positive at lower parities to less positive at higher.

The effects of ideal family size (Figure 3d) on desire for another child are positive in most of these regressions and significant in the majority of cases. Overall, the effects of IFS seem to be strongest at two children; the Indonesian sample is an exception, with stronger effects showing at three and four children.

Economic contributions from children (Figure 3e) was expected to be more important at higher parities. This variable does not have its strongest positive effects in the five-and-above group, however, but at three or four children, though the pattern is somewhat uneven. Family name only occasionally affects desire for another child significantly; the significant effects, both positive and negative, are confined to the lower parities. Gender preference (Figure 3f) has its strongest effects generally at intermediate parities, principally at two children and sometimes at three. Companionship rewards has scattered effects, though there are two cases where it has most importance at no children. Sibling companionship (Figure 3g) seems to be important principally at one and three children.

Financial costs of children does not affect desire for another child consistently. Its effects are not always negative and show no tendency to increase or decrease across parities. In the combined regressions, restrictions on parents (Figure 3h) was important chiefly in the more advanced countries. In Singapore, restrictions affects desire for another child most among those with no children; in the United States, its greatest effects are at three children and one child. Restrictions on work, finally, is significant in only two regressions and shows no clear pattern across parities.

Ideal Family Size

Somewhat different variations in the effects of predictors on ideal family size--often equally inconsistent--may be noted (Figure 4 and Appendix D). Some pattern appears for the first two age-experience variables, though the differences are minor and hardly noticeable. Age at first birth shows a slight tendency to have larger positive effects at five children, but the differences in coefficients are small, and effects are significant at five children only once. Marriage duration is somewhat similar, but the pattern is even weaker.

For having been married more than once, the direction of the effects is quite inconsistent. For instance, two of the largest negative coefficients are obtained at the two highest parities among U.S. wives, but two of the largest positive coefficients are obtained at the same parities among U.S. husbands. For child loss (Figure 4a), the coefficients seem to be more generally positive. There may be a slight tendency toward larger positive effects at lower parities among wives, but the results for husbands run in the other direction.

Income (Figure 4b) was expected to increase in negative impact at higher parities. This does seem to be the case among Korean and Taiwanese wives and Indonesian husbands; however, it is not the case in the other groups. For wife's education, no pattern to the effects appears. Urban residence and media exposure both show scattered effects, predominantly but not exclusively negative. There is no evident pattern to these effects across parities.

Desire for another child (Figure 4c) is one variable that does show a clear pattern of effects on ideal family size: at lower parities, from 0 to 2, its effects are significant much more often than at higher parities, and the coefficients are generally larger as well.

Of the values of children, economic contributions (Figure 4d) is the most interesting. In particular groups, its effects are most positive at no children, but in other groups they are most positive at four or more children. The first condition holds for all the female groups except in Korea and Taiwan, where the second condition holds. The male groups

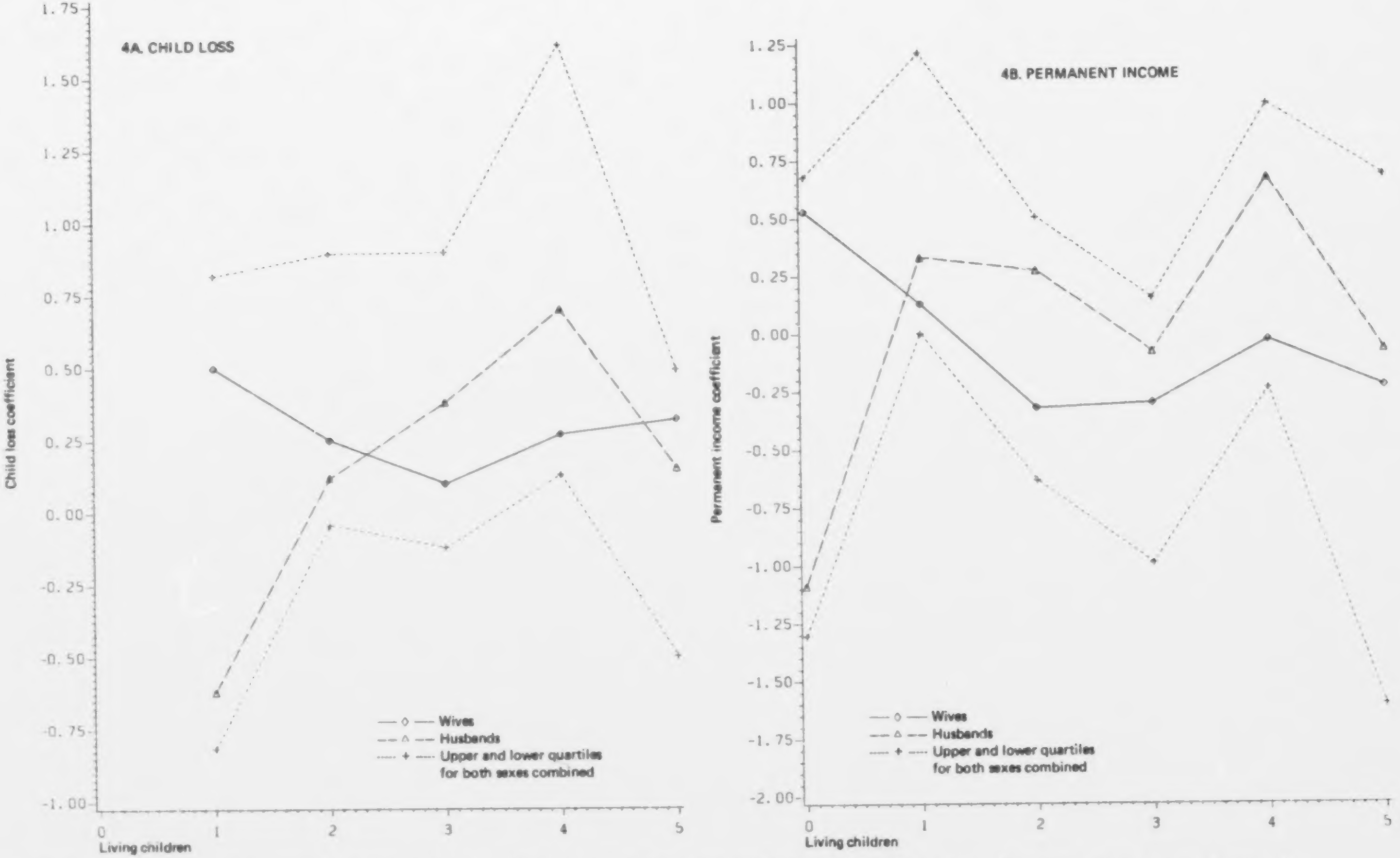
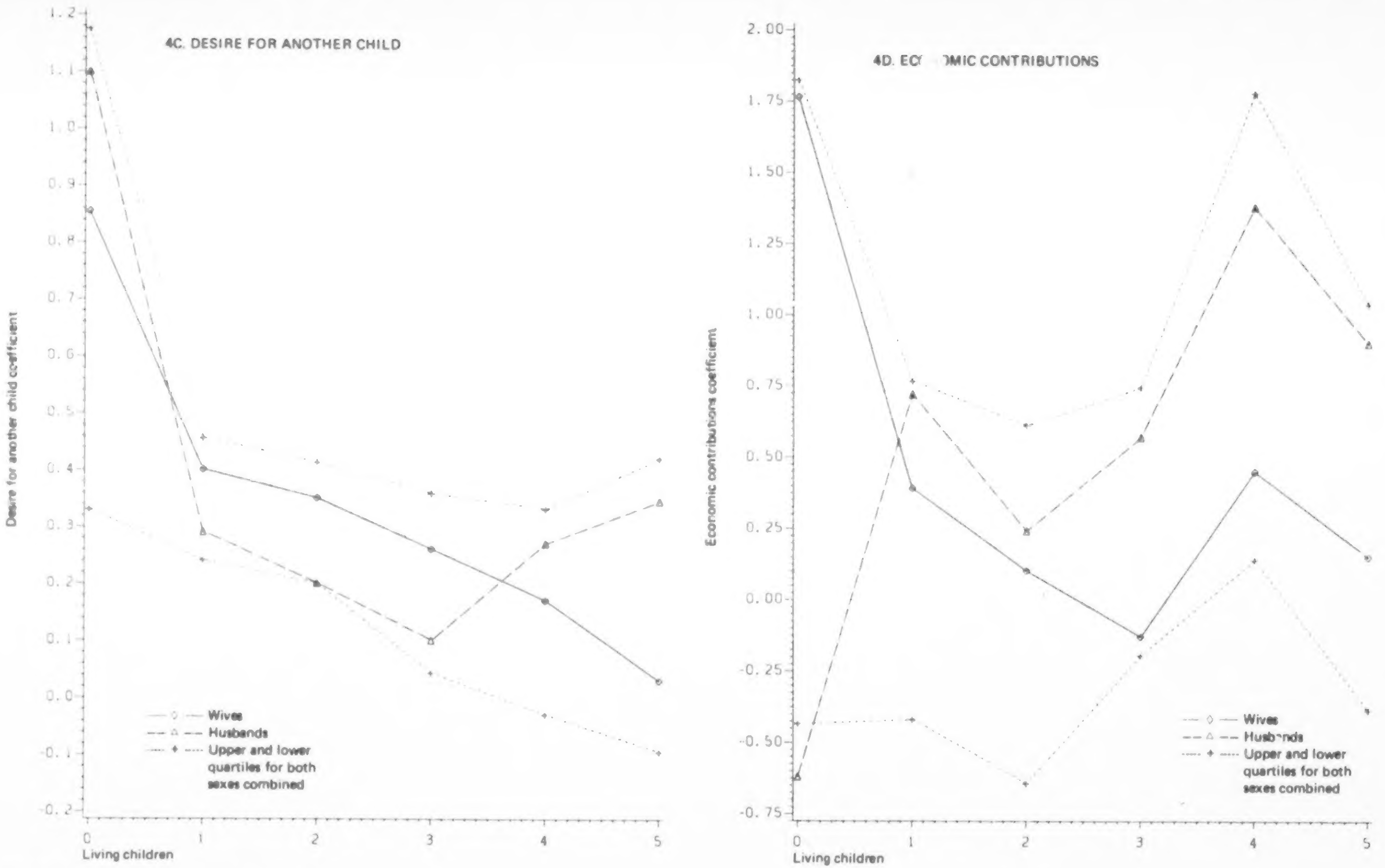


FIGURE 4. Regression coefficients for selected predictors of ideal family size, by sex and number of living children



4C. DESIRE FOR ANOTHER CHILD

4D. ECONOMIC CONTRIBUTIONS

FIGURE 4. *(continued)*

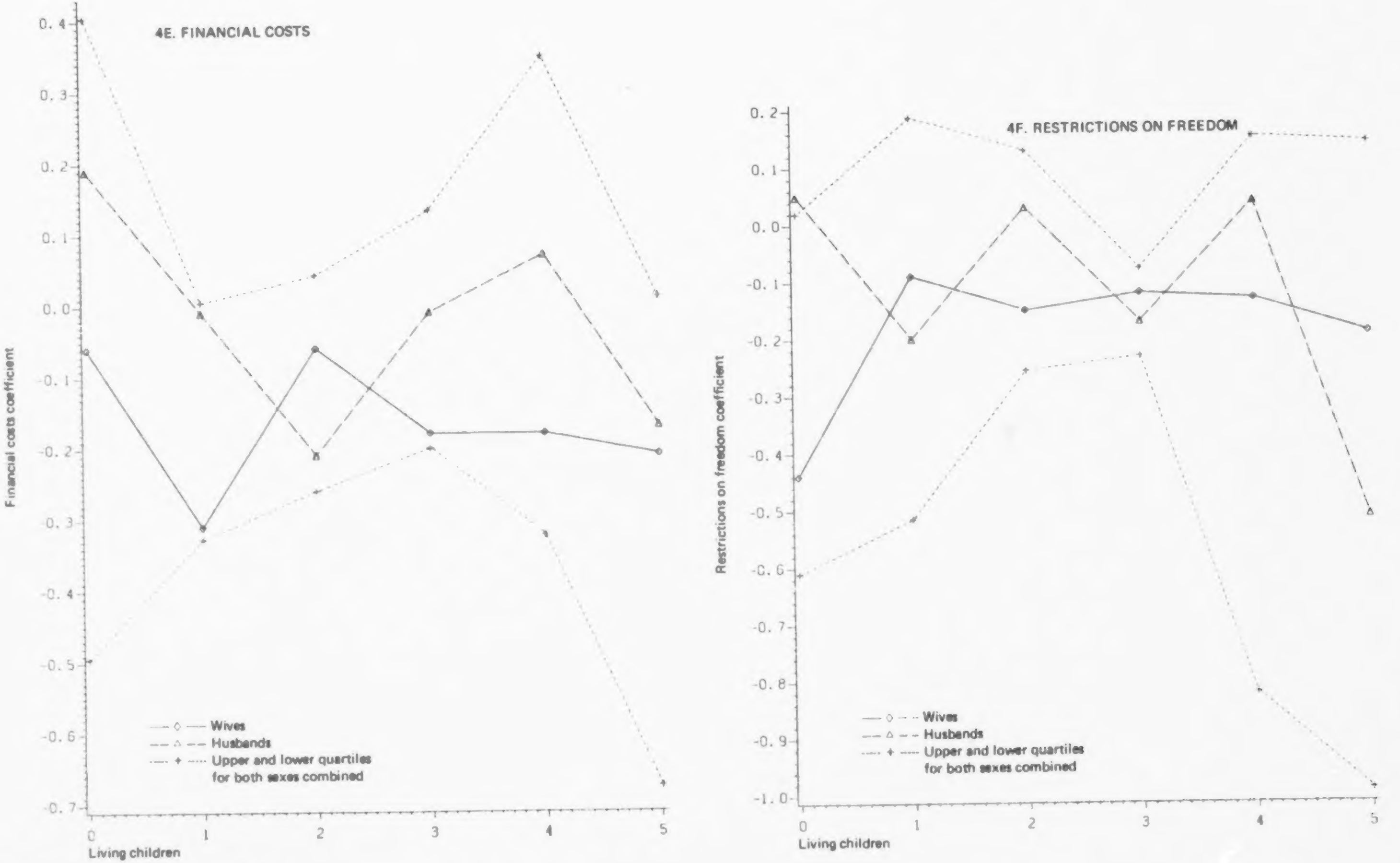


FIGURE 4. *(continued)*

are harder to characterize because of the number of times regressions could not be run at no children. However, the first condition comes closer to characterizing husbands in Singapore and the United States and the second condition husbands in the Philippines, Indonesia, Korea, and possibly Taiwan. For family name, the signs of the effects are occasionally negative and occasionally positive, with no pattern, although the few significant positive effects are mainly at low parities. Gender preference, similarly, lacks any clear pattern: among husbands, especially in Korea and the United States, it seems to have increasingly positive effects on ideal family size at higher parities, but this pattern does not appear in the majority of groups. Companionship, the last of the values in these regressions, similarly shows no clear pattern.

Among the disvalues, financial costs (Figure 4e) has its most negative effects on ideal family size in a few cases at higher parities, as in the United States and Singapore. Again, however, this does not hold for all or even the majority of groups. Restrictions on freedom (Figure 4f), which was important mainly in Singapore and the United States, has its greatest effects at five or more children in these cases, except among U.S. husbands. For restrictions on work, significant negative effects are also at highest parity for both Turkish groups, but this does not hold for other groups.

DISCUSSION

Some of the predictions appear supported in the analysis, but others do not, and in a number of cases the evidence is unclear. The results relevant to each prediction will now be reviewed. Where coefficients are not significant, attention will still be paid to their signs to determine if these agree with the predictions. In the comparisons of coefficients across parities, differences in magnitude will be addressed even when it is not clear whether these are significant. There is, of course, some danger of overinterpretation here.

Age and experience

Although it was not determined whether any pregnancies were unintended, it was expected that such pregnancies would raise preferences because of rationalization or cognitive balance, or the adjustment of fertility preferences to agree with number of living children. Such a process may be suggested by the fact that desire for another child declines as number of children increases, but at a decreasing rate. Ideal family size increases with number of children, also suggesting some rationalization; however, this increase gradually tapers off. One interpretation of these results is a partial but not complete adjustment of number preferences to include some but not all existing children, although other interpretations are of course possible. For instance, individuals may be essentially attaining their original preferences, but with some tendency to overshoot because of the psychosocial and economic costs involved in regulating fertility; or individuals who reach higher parities may be a selected group that continually wants more children in spite of exceeding their ideals. However, these interpretations do not account for the positive dependence of ideal family size on desire for another child, even after the reverse relationship is accounted for.

Age at first birth was expected to have a negative impact on fertility intentions. Its effects on desire for another child are in fact fairly uniformly negative—though only occasionally significant—and essentially similar across subgroups of each sample. The same predominantly negative effects are observed when an attempt is made to predict recent childbearing (within the last two years). The prediction therefore seems to be supported, though not strongly. However, the effects of age at first birth on ideal family size are unexpected: these effects are predominantly positive, and again a few are significant. Thus it appears that those who first give birth later are more likely to intend to stop childbearing earlier, but still express a preference for larger families. The reasons for this apparent contradiction are not evident.

The prediction for marriage duration was, similarly, that it would have a negative influence on preferences. Besides marriage duration, the age of the oldest child was included in the regressions as another and perhaps a better measure of the length of the fertility career. Both variables had the predicted effects on desire for another child, as well as on recent childbearing: almost uniformly negative and occasionally significant. The effects were slightly larger among those with only one or two children, possibly suggesting that, after having attained these minimum numbers of children, couples are more ready to stop. However, the effects of marriage duration on ideal family size (age of oldest was not used in these regressions) were the reverse, being generally positive. This can be interpreted as a cohort effect, older women preferring larger families. Such an interpretation is supported by the fact that when wife's age replaces marriage duration, the effects on ideal family size are similar; it is also supported by the greater strength of the positive effects for rural women, among whom cohort differences should be more pronounced (given greater discontinuities between generations).

Having a previous marriage was expected to reduce childbearing intentions within the current marriage. As with the two preceding predictions, there were contrary results for desire for another child and ideal family size, and other complications as well. Having been married previously was important for fertility preferences mainly in the countries where divorce was more common: Indonesia, the United States, and, to a lesser extent, Turkey. In these countries, it generally had significant positive effects on desire for another child and significant negative effects on ideal family size. When the Indonesian sample was broken into subgroups, however, both of these results were reversed for all the subgroups. It is possible to rationalize the results for the United States and Turkey: perhaps the negative effects on ideal family size represent the predicted reduction in fertility preferences, whereas the positive effects on desire for another child reflect the fact that previously married respondents count among their living children some from the previous marriage and therefore are more likely to want to continue childbearing in order to have children in the current marriage. However, the reverse results for Indonesia suggest caution with such interpretations and indicate that culturally specific factors may also be at work.

It was predicted that having experienced child loss would lead to lower preferences for surviving children (though higher preferences for births). The effects of child loss on desire for another child are variable in sign and essentially negligible; since number of living children is controlled, the implication seems to be that those who have experienced child loss are on average content when they have made up for the loss. Again, however, the results for ideal family size tell a somewhat different story: where child loss is more common, personal experience of it is related to larger ideal family sizes. In several cases, these effects are stronger for rural subgroups, among whom child loss should also be more common. This could be interpreted as an "insurance" effect against child loss, affecting ideals only, where mortality is higher; when couples have actually made up for a loss, there is no further impetus to have more. There is a slight suggestion in the data that the insurance effect may be stronger, as Heer (1983) predicts, among wives who still have few children, though not among husbands.

Gender composition was expected to have some impact, probably positive. Gender composition was represented by two variables: the proportion of boys among the respondent's children and the imbalance, in either direction, between sons and daughters. It was not expected that either of these variables would affect ideal family size directly (though indirect effects through desire for another child are possible), and they were therefore included only in the regressions for desire for another child. In these regressions, imbalance had consistently strong, positive effects. The U.S., Indonesian, and Turkish males appear to be the only exceptions; however, the parity-specific results show that, even in these groups, substantial positive effects are obtained at higher parities. On the other hand, the negative effects of the proportion boys on desire for another child are limited to particular countries, appearing as significant mainly in Korea and Taiwan, and in some of the regressions for Turkey and Singapore. This is consistent with expectations for the countries that should show son preference (Williamson, 1976; Arnold and Kuo, 1982). It therefore appears that those with an imbalance between sons and daughters, and in some countries those with a smaller proportion of sons, are more likely to continue childbearing. This suggests either that couples are more often optimistic about the likelihood of having a child of the sex they want, or that they value positive outcomes more strongly than they fear negative outcomes. It does not indicate, however, that couples with an unfavorable gender composition will therefore seek to exceed the family size they would have otherwise; the possibility cannot be ruled out that those with a more favorable composition will instead stop childbearing prematurely. No predictions were made for the impact of gender composition at different parities; however, it was predicted that the gender preference value should have greater impact at intermediate parities. It may be noted that gender composition does seem to have larger effects among those with three to five children, rather than among those with fewer, which is consistent with the prediction for values. Overall, some results for the age and experience variables are very much in line with the predictions, though not all the predictions are supported.

Socioeconomic characteristics

For the predictions relating to the socioeconomic measures, the results are less supportive. It was expected that income would have a positive influence on fertility preferences at low parities and a negative influence at high parities. The measure of income was somewhat unsatisfactory: it depended, for some countries, on a fairly limited category system and was not strictly comparable across countries. A permanent income measure was derived from this, but the original measure of current income was also used as an alternate. The results were not as expected. With all the parities combined, permanent income generally had positive effects on desire for another child and ideal family size among husbands, but among wives the effects were generally negative. Few of the effects were significant. Results were no better with the current income measure; in fact, the effects on ideal family size appeared to be more negative among husbands. The effects of permanent income on ideal family size appeared to be more strongly positive among rural husbands, but not among the other groups. Finally, when an attempt was made to predict recent childbearing, permanent income was shown to have almost uniform negative effects, significant in several cases. A coherent interpretation of these apparently contradictory results is not possible here. For the results for recent childbearing, which are the strongest, it might be noted that indirect effects of income, such as its relation to husband's education or to contraceptive availability, might be responsible (e.g., Mueller and Short, 1983), but this does not account for the other results. Since opposite effects at different parities were predicted, the possibility that these cancel out in the combined regressions should be considered next as a possible explanation.

Regressions for a few scattered country-sex groups conform to the predicted pattern of positive income effects at low parities and negative effects at high parities. Notable among these are the regressions for desire for another child for U.S. wives. Most of the groups do not conform to this pattern, however, or to any recognizable alternative. Since most of the previous work on income effects across parities has been with U.S. women, the confirmatory results for this group provide some confidence in the procedures used here. However, the negative results for the other groups are damaging to the hypotheses. Problems with the measurement of income may be at the root of the failure to confirm the predictions. It is also possible, however, that income has such different meanings in each country, being linked to other social characteristics in quite different ways, that the predictions are simply not viable cross-culturally.

Education, the other socioeconomic variable used in these regressions, was expected to have negative impact on preferences at lower parities. It might also be expected to have a negative effect in the combined regressions. The effects of wife's education are generally weak and nonsignificant, though negative more often than not, on both desire for another child and ideal family size. Its effects on ideal family size seem to be stronger among rural residents. In the prediction of recent childbearing, its effects are essentially negligible. Husband's education, which was used in a few regressions, has even weaker effects. Across parities, no stronger effects are noted among those with fewer children. Again, however, there is one important exception: in regressions for desire for another child among U.S. wives, the largest and only significant effects occur among those with one child. Thus the pattern found in a few previous studies, mainly with U.S. women, appears to be confirmed for this group, but the analysis fails to extend it to other groups.

Values and disvalues of children

For values and disvalues of children, the predictions are fairly specific, usually referring to the particular parity or parities at which specific values or disvalues will be important. Following previous research, the predictions refer to the values involved in having the next child; the parity-specific regressions, on the other hand, were run by number of living children, which is one below the number of the next child.

It was predicted that economic contributions of children would influence preferences positively at higher parities. Economic contributions usually has positive effects on desire for another child, but these are not significant, and the sign is less consistent in the logit regressions. On ideal family size, on the other hand, stronger and more often significant positive effects are observed. Contradictory negative effects on both preference measures appear mainly in the U.S. and in some Singapore regressions—as one would expect, these are the cases where children's economic contributions are negligible. Across parities, patterns are roughly supportive of the prediction: no effect or even a negative effect is observed in the more-developed countries, but in the other countries the effects on desire for another child are stronger for those with three and four children (i.e., in relation to having the fourth or fifth child) than for those at lower parities. For some unexplained reason, the effects are not stronger among the groups with five or more children. In the regressions for ideal family size, the patterns are clearer: the effects of economic contributions seem to be greatest among those with four or five or more children. There are some anomalies here too, however: for a few groups, the strongest effect is observed among those with no children. Therefore, some support can be claimed for the prediction relating to economic contributions, but there are unexplained departures from the expected pattern.

It was predicted that family name would have positive impact, mainly in relation to the first child. There is little support for this in the data. The effect of family name seems more often positive than negative, but is typically weak and often inconsistent; the only notable effect is on desire for another child among Korean husbands. All the significant effects that emerge in the subgroup regressions are positive, but nonsignificant negative effects also appear. Across parities, the few notable effects on desire for another child appear at lower parities, but these are both positive and negative. The only significant positive effects on ideal family size appear at one child; however, these are few and scattered. Thus no real support appears for family name, which seems at least less important than economic contributions. Because continuing the family name depends in most of these countries not specifically on the first child, but on the first son, an emphasis on family name is generally strongly linked to a preference for sons. Perhaps, then, the weak effects of family name may be partly due to its operating through the effects of gender composition and gender preference, which are also in the regressions.

The influence of gender composition on fertility intentions has already been noted. It was predicted that gender preference as a value would also contribute to intentions, raising them particularly at intermediate parities. The measures of gender preference used combine preferences for sons and daughters; since they are based on ratings of reasons for wanting another child, those who express a strong preference for one or the other may be motivated by an absolute preference for children of a specific sex or by a desire for balance. The effects of gender preference on desire for another child are clearly positive and usually significant. Since gender composition is also included in these regressions, this result appears to confirm that, with reference to these variables at least, subjective values contribute to fertility intentions over and above the effect of objective circumstances. The effects of gender preference on ideal family size, by contrast, are inconsistent, whether in the combined regressions, the subgroup regressions, or the parity-specific regressions: they are alternately positive and negative, hinting again that ideals may not adjust completely to actual fertility intentions. This also provides further justification for the omission of gender composition from the regressions for ideal family size. Across parities, the pattern of effects on desire for another child is just as predicted, the greatest effects being observed principally at two and occasionally at three children (i.e., in relation to having a third or fourth child).

For the companionship value of children—the main psychosocial value included here—the results are less supportive. The expectation was that this value would have positive impact on preferences at low parities. In the combined regressions, it generally has positive effects, significant in a couple of cases, on desire for another child. On ideal family size, however, there are a few significant effects in both directions. One possible interpretation for these contradictory results is this: as a value parents obtain from children, companionship may be positively related to wanting children; however, as a value that educated, urban couples are more likely to emphasize, it may be associated perforce with smaller family-size preferences and a greater desire for child quality. The parity-specific regressions also show a mix of positive and negative effects and no clear priority for this value at lower parities.

Companionship for siblings is an aspect of the companionship value treated separately because of its specific importance in relation to the second child. The prediction, based on several other studies, was that this value would be of great positive significance for intentions to have a second child. Used only in the regressions for desire for another child, sibling companionship usually has positive effects, significant in two cases. The parity-specific regressions are more interesting. Though significant only in one case, the greatest positive effects of sibling companionship were most often among those with one child, i.e., those contemplating a second. Where this was not the case, the greatest effects were among those with three children, contemplating a fourth. Thus, although there is support here for the original prediction, there is also an indication that some consider having a fourth child as a companion for the previous three.

Of the disvalues, financial costs are the most often cited in studies of the value of children (Fawcett, 1983). It was expected that this disvalue would be of significance primarily in societies undergoing rapid economic transformation, and probably mainly at high parities. No such neat results appear. The effects of financial costs on desire for another child are of variable sign, though more often negative. Its effects on ideal family size are more consistently negative, and significant about half the time. The suggestion in these results is that financial costs are an important factor in the development of ideal preferences, but do not strongly influence actual intentions. Contrary to the prediction, no stronger effects appear for the newly industrializing countries of Korea and Taiwan. From the subgroup results, it may also be noted that financial costs has stronger effects on ideal family size among urban wives (Singapore and the United States being the exceptions). The import of this is not clear: it may relate to proportionally greater child costs or greater internalization of them within the nuclear household in urban areas; it may also relate to the greater exposure of urban wives in the less-developed countries to population-control propaganda, and the consequently greater likelihood that they would express preferences, at least in ideal terms, for small families because of the cost of large ones. Across parities, there is little pattern in the effects of financial costs on desire for another child. Among the effects on ideal family size, the largest do appear at the highest parity in the United States, as well as for Singapore husbands and Indonesian wives. However, this is not true in the remaining cases.

The next disvalue, restrictions on parents, was expected to have impact only in the more-developed countries. This was borne out: the significant negative effects, on both desire for another child and ideal family size, were largely confined to the United States and Singapore (and largely among wives, though Taiwanese husbands also showed some impact). There were subgroup variations, the effects being stronger among U.S. urban women and Singaporean Malays. It was also expected that this disvalue would be of greater consequence at low parities; however, the results in this regard were less clear. On desire for another child, the effects were strongest in Singapore among those with no children, but in the United States they were stronger among those with one and three children. On ideal family size, the effects seemed to be stronger in these two countries at the highest parities. Feeling tied down by children is not consistently associated primarily with the first child; given somewhat longer spacing between children and alternate forms of childcare past infancy, later children may restrict parents' activities equally severely.

The final disvalue, restrictions on the wife's work, like restrictions on parents, was expected to be of significance mainly at low parities, not necessarily only in more-developed countries. The evidence seems to be that this value is of less consequence for fertility intentions. Its effects on desire for another child and ideal family size are variable and inconsistent, and no patterns are noted across parities, the only possible exception being a stronger negative effect on ideal family size at the highest parity in Turkey. As in previous research on the value of children (Bulatao, 1979a), work restrictions appear less important than broader restrictions on the parents' freedom and ability to dispose of their own time.

Other factors

Although no predictions were made about normative thresholds and the homogenization process, the results can still be examined for their relevance to these other factors. The effects of age and experience, socioeconomic characteristics, and values and disvalues are not confined to either high or low parities, nor are they uniformly accentuated at any specific parity in between. Examination of the parity-specific regressions by country fails to turn up any "normative thresholds" that apply to the majority of variables. Perhaps these thresholds can only be observed among more narrowly defined groups within which there is more normative consensus. Neither is there any evidence that fertility intentions are less predictable at higher parities. Perhaps, again, one has to observe still higher parities.

CONCLUSION

An attempt has been made here to explain fertility intentions cross-culturally, taking special account of sequential factors within the fertility career. The data analyzed were for seven countries—mainly in East and Southeast Asia, but also including Turkey and the United States—covered in the Value of Children surveys. Fertility intentions or preferences were represented by two measures—the desire for another child and ideal family size. These measures were assumed to be mutually interdependent, and two-stage least squares regressions were run to predict them, including among the predictors age and experience variables, socioeconomic measures, and indices of the values and disvalues attached to children. Separate regressions were run for wives and husbands in each country; further regressions were run, within each of these groups, for urban and rural or for ethnic subgroups; and regressions were run, finally, for those with different numbers of living children within each country-sex group. (Additional regressions with alternate predictors, as well as with a measure of actual fertility–childbearing within the last two years–were also reported.)

Measures of fertility intentions: a contrast

The results reported here indicate important differences between the desire for another child and ideal family size, though the two are strongly interdependent. At higher parities, many of those who want to continue childbearing would do so despite having attained their ideals; ideals appear to be somewhat more restricted in range or more clustered, perhaps reflecting social norms to a greater extent than personal predilections (Mason, 1983). Nevertheless, ideals are influenced by desires, especially in the early stages of childbearing when ideals are presumably more fluid. Desires are also affected by ideals, particularly when the individual considers whether to go beyond two children.

The predictors of the two measures are substantially different. Desire for another child falls, though at a decreasing rate, as parity rises and couples attain their childbearing goals. Ideal family size rises with parity, also at a decreasing rate, either because of heterogeneity or because couples rationalize having had additional children. Age and experience variables influence the measures in opposite ways: the expected effects of delay on reducing childbearing intentions and of gender preference on increasing them given particular gender compositions are observed only for desire for another child and not for ideal family size. Although marriage duration also affects ideal family size, this effect is the reverse of that expected and appears to reflect cohort differences rather than duration itself. Ideal family size thus seems less susceptible than desire for another child to reshaping in the course of the fertility career and more predictable from enduring characteristics of the individual or couple. An apparent exception to this generalization is the effect of child loss, which is negligible on desires but positive on ideals. It may be argued, however, that the positive response of ideals to child loss is a gross, probably one-time adjustment that is not modulated by later experience in making up for the loss, as desires might be.

The two preference measures also differ in their responsiveness to "economic" variables–income, perceived economic contributions of children, and their perceived financial costs. These variables, especially the last, affect ideal family size more strongly than desire for another child. Since a number of the economic costs and benefits of a child are incurred or accrue years after birth, it may not be surprising that specific birth intentions are less responsive to them than are preferences for total number of children over the fertility career.

The predictors of ideal family size in these regressions, it is important to note, resemble more closely the standard predictors of fertility and fertility preferences (but see Pullum, 1983) than do the predictors of desire for another child, among which sequential factors figure more prominently.

Predictors of fertility intentions, confirmed and unconfirmed

The variables used as predictors in the regressions were chosen on the basis of previous studies, which suggested a number of factors that would have "sequential" effects on preferences. Predictions about the effects of the age and experience variables could be taken per se as reflecting sequentiality. For the other variables, sequentiality was indicated in predictions that socioeconomic and psychosocial measures would have different effects at different parities. Cross-sectional tests of these predictions do not, of themselves, establish sequentiality; other explanations are possible, like the increasing selectivity of the sample at higher parities. However, confirmation of particular predictions does complicate any simple-minded approach to fertility intentions.

The age and experience variables mostly had the expected effects, though primarily on desire for another child rather than ideal family size. Of these variables, gender composition, particularly imbalance between number of sons and daughters, appeared to have the strongest effect (not counting the influence of number of living children).

For the socioeconomic variables, predictions were more specific, and results overall less satisfactory. Income and education did not show the sequential effects expected, except among U.S. wives, calling into question the generality of results previously obtained mostly with

U.S. samples. However, the income measure had various drawbacks; a better measure might have produced different results.

For the value and disvalue indices, some predictions were supported, and others were not. Those values or disvalues that appeared to have a stronger influence in regressions with all parities combined were also generally those that produced the expected sequential effects. This was the case for economic contributions, gender preference, sibling companionship, and restrictions on parents: each had some effect in the combined regressions and also appeared to have a greater effect, in the parity-specific regressions, at or around the parities predicted. Of these values, the results for gender preference again were clearly the strongest; for the others, the results were in line with predictions but sometimes relatively weak. By contrast, for family name, companionship, and restrictions on the wife's work, neither general effects on preferences nor the predicted parity-specific pattern was obtained. The last disvalue, financial costs, did affect ideal family size, but had no parity-specific pattern. It is possible that, where the effects are inconsistent or absent, the value or disvalue is inadequately measured, or these effects may simply be too weak in comparison to those of the other variables in the equations to stand out.

Country variations: a general hypothesis

None of these results was perfectly uniform across countries. Some did appear most of the time, like the effects of number of living children, imbalance between numbers of sons and daughters, and gender preference. Others seemed to be specific to particular countries or groups of countries, reflecting either distinctive cultural features or varying levels of development.

Having been previously married affected preferences mainly where divorce was more common, i.e., in Indonesia, the United States, and Turkey. Even among these countries, the influence of a previous marriage varied, for reasons that may be largely specific to each country. Cultural factors similarly appeared to dictate where the proportion of sons among one's children would raise fertility intentions–namely, where high son preference was an established pattern, as in Korea and Taiwan.

Like having been married previously, child loss was of significance where it was more common, i.e., essentially in the less-developed countries in the sample. Its effect was more consistent than that of a previous marriage, however: it increased ideal family size. Also limited to less-developed countries (but including, in this case, some newly industrializing countries) was the effect of children's economic contributions, which may be assumed to be minimal in developed societies. The financial costs of children, on the other hand, appeared to have impact on ideal family size across the board, but with stronger effects among urban wives in the less-developed countries. The main effect confined to more-developed countries was the effect on fertility intentions of restrictions on freedom, which was not salient in less-developed countries.

A possible hypothesis to explain these localized effects is that particular factors have to attain some minimum level of frequency or importance in order to have an impact on fertility intentions. Whether there are in fact such thresholds, what they are for each factor, whether thresholds apply to other variables also, and what cultural and developmental factors are related to crossing each threshold may all deserve further study.

In the attempt to test predictions cross-culturally in this paper, no special attention has been paid to the pattern of results for each specific country. The major variations among countries, as just noted, appear reasonable; there are of course many other variations in the magnitudes of specific coefficients. These may warrant further attention, as well as further analysis introducing factors specific to each country, but the similarities across countries have been particularly notable.

Single and successive decisions

The perspective adopted at the start of this study was that the initial fertility decision early in the marriage and changes in intentions throughout the couple's fertility career are both important, though the relative weight of each is unknown. The results are generally in line with this perspective, indicating that some factors have the same effect on fertility preferences regardless of family size, whereas others have differential effects and are more relevant to fertility intentions at particular points in the fertility career.

As suggested at the outset, the distinction between ideal family size and desire for another child appears to reflect the distinction between the single initial decision made by a couple about their fertility and the successive decisions they make as the family grows. The interdependence of the two measures, and the differences between their predictors, suggest that the single-decision and the successive-decision perspectives are not conflicting, but rather complementary in explaining different aspects of the complex process by which fertility intentions are determined.

The data used here have been cross-sectional, of course; the study has not followed individuals through their fertility careers to see how preferences actually change. Longitudinal analyses, particularly if results could be compared cross-culturally, would provide important additional evidence on the degree of such changes and the factors involved in them.

APPENDIX A. ESTIMATION OF PERMANENT INCOME

Household income with husband at age 40 was chosen as an indicator of permanent income. This indicator includes household income from all sources, since sources are not distinguished in the Value of Children survey data. In these data, household income was coded in fairly broad categories–as few as 8 in one country, but as many as 18 in other countries.

Current household income was regressed on husbands' and wives' characteristics, including whether the wife was working, and, in some cases, dummy variables for household composition. Separate regressions were run for respondents of each sex in each country, with other specific predictors varying slightly. Table A1 lists these, and Table A2 gives means and standard deviations; the regression results appear in Table A3. R^2 for these equations was generally between 0.35 and 0.47.

The equations were used to estimate household income when husband's age was set at 40. (In two groups–wives in Turkey and in Indonesia–husband's age was not available, and wife's age was set at 40 instead.) If a household composition variable was included in the equation, it was set, for purposes of this estimation, to indicate that there were no extra adults in the household beyond the couple, or that the household was nuclear. The reason for this was that the presence of extra adults appeared to be a function of the family life cycle.

TABLE A1. Variable definitions

CINC	total household income, expressed annually for the Philippines and the United States and monthly for the other countries; coded in various numbers of categories, ranging from 8 to 18
HSAGE	husband's age in years
HSAGESQ	husband's age squared
AGE20,	dummy variables indicating husband's age, used if exact age was not available (e.g., AGE25 = 1 if husband is between 25 and 29)
AGE25,	
AGE30,	
AGE35,	
AGE40,	
AGE45	
HEDUC	husband's education; in years for the Philippines, Turkey, and the U.S.; by level for the other countries
OCC1	first dummy variable for husband's occupational class: upper professional and technical workers[a]
OCC2	administrative, executive, managerial workers
OCC3	lower professional and technical workers (used for the Philippines and Turkey; for the other countries, included in OCC1)
OCC4	sales workers (for the U.S., this variable represents sales and clerical workers)
OCC5	clerical workers
OCC6	upper skilled workers (for the U.S., represents craftsmen, foremen, and kindred workers and protective service workers)
OCC7	upper service workers (for Indonesia, Taiwan, and Singapore, includes OCC11)
OCC8	transport and communication workers
OCC9	lower skilled workers (for Indonesia, includes OCC6 and OCC10; for the U.S., represents operatives and kindred workers)
OCC10	unskilled workers (for Korea, includes OCC6 and OCC9; for the U.S., represents laborers, including farm)
OCC11	lower service workers (for the U.S., includes OCC7)

TABLE A1. *(continued)*

OCC12	farm owners and farmers
OCC13	farm tenants
OCC14	fishermen
OCC15	farm laborers
WFAGE	wife's age in years
WFAGESQ	wife's age squared
AGW20, AGW25, AGW30, AGW35	dummy variables indicating wife's age, used if exact age was not available
EARN	whether wife is currently earning (dummy variable)
WEDUC	wife's education; in years for the Philippines, Turkey, and the United States; by level for the other countries
EXAD	number of extra adults in the household besides the couple
HH1, HH2, HH3	dummy variables for whether household is nuclear (HH1), extended (HH2), or multicouple (with more than one couple, HH3)
URB4, URB3, URB2, URB1,	dummy variables for residence, from most urban (URB4) to most rural (URB1)
REG1 to REG10	dummy variables for region of residence within country; regions are, in order: Philippines--Cagayan, Ilocos, Central Luzon, Southern Tagalog, Bicol, West Visayas, East Visayas, Central Visayas, Mindanao, and City of Manila; Indonesia--Salatiga, Solo, Bandung, and Tasikmalaya; U.S.--Northeast, North Central, South, and West.

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[a] Some occupation variables were used only in specific countries because of differences in classification. The category left out in regressions was either all farmers, farm laborers specifically, or, for the U.S., all laborers.

TABLE A2. Means and standard deviations, by country and sex

	Wives		Husbands	
Variable	Mean	S.D.	Mean	S.D.
	Philippines (1,552 wives, 359 husbands)			
CINC	6.127	3.894	6.025	3.841
HSAGE	33.209	7.145	32.621	7.431
HSAGESQ	1153.841	518.541	1119.201	549.154
HEDUC	8.104	3.640	8.136	3.469
OCC1	.034	.182	.042	.200
OCC2	.013	.113	---	---
OCC3	.010	.098	.008	.091
OCC4	.071	.257	.050	.218
OCC5	.061	.240	.072	.259
OCC6	.068	.252	.061	.240
OCC7	.041	.197	.031	.173
OCC8	.105	.307	.123	.328
OCC9	.137	.344	.143	.355
OCC10	.045	.208	.033	.180
OCC11	.011	.107	.005	.074
OCC12	.007	.084	.011	.105
OCC13	.300	.458	.315	.465
OCC14	.055	.229	.061	.240
EARN	.525	.499	.571	.496
WEDUC	7.733	3.475	7.646	3.316
HH2	.183	.387	.170	.376
HH3	.125	.331	.117	.322
URB3	.205	.404	.192	.395
URB2	.208	.406	.192	.395
REG1	.049	.216	.058	.236
REG2	.042	.202	.033	.180

TABLE A2. *(continued)*

	Wives		Husbands	
Variable	Mean	S.D.	Mean	S.D.
REG3	.121	.326	.100	.301
REG4	.318	.466	.298	.458
REG5	.079	.269	.092	.289
REG6	.137	.344	.175	.381
REG7	.039	.194	.033	.180
REG8	.109	.312	.095	.293
REG10	.028	.164	.033	.180
	Turkey (1,475 wives, 341 husbands)			
CINC	5.648	3.532	5.138	3.418
AGE20	---	---	.100	.293
AGE25	---	---	.261	.428
AGE30	---	---	.212	.398
AGE35	---	---	.200	.390
AGE40	---	---	.127	.325
HEDUC	5.250	3.246	5.309	3.205
OCC1	.064	.237	.076	.259
OCC2	.109	.303	.106	.300
OCC3	.027	.158	.028	.160
OCC4	.124	.320	.111	.306
OCC5	---	---	---	---
OCC6	.102	.293	.088	.275
OCC7	.085	.270	.061	.234
OCC8	---	---	---	---
OCC9	.061	.233	.053	.218
OCC10	.085	.271	.068	.244
OCC11	.033	.173	.037	.184

TABLE A2. *(continued)*

	Wives		Husbands	
Variable	Mean	S.D.	Mean	S.D.
OCC12	.238	.413	.316	.453
AGW25	.227	.406	---	---
AGW30	.178	.371	---	---
AGW35	.250	.420	---	---
EARN	.310	.449	.319	.454
WEDUC	3.093	3.267	3.082	3.325
EXAD	1.750	2.717	1.904	2.495
URB4	.138	.335	.144	.342
URB3	.285	.438	.231	.411
URB2	.304	.447	.317	.454
	Indonesia (1,912 wives, 938 husbands)			
CINC	5.339	2.032	5.417	2.071
HSAGE	---	---	35.221	7.370
HEDUC	5.625	4.248	5.707	4.373
OCC1	.062	.241	.065	.247
OCC2	.107	.309	.119	.324
OCC3	---	---	---	---
OCC4	.107	.309	.094	.292
OCC5	.053	.224	.049	.216
OCC6	---	---	---	---
OCC7	.044	.206	.034	.182
OCC8	.018	.134	.016	.125
OCC9	.108	.310	.097	.296
WFAGE	28.761	5.736	---	---
EARN	.390	.488	.401	.490
WEDUC	4.249	3.749	4.333	3.772

TABLE A2. *(continued)*

Variable	Wives Mean	Wives S.D.	Husbands Mean	Husbands S.D.
URB2	.806	.395	.809	.393
REG1	.258	.438	.252	.434
REG2	.252	.434	.245	.430
REG3	.241	.428	.248	.432
	Korea (1,411 wives, 427 husbands)			
CINC	3.458	1.538	3.626	1.513
HSAGE	--	--	34.478	5.933
HEDUC	10.018	4.067	9.525	4.323
OCC1	.049	.216	.060	.238
OCC2	.044	.206	.031	.174
OCC3	--	--	--	--
OCC4	.143	.351	.142	.350
OCC5	.136	.344	.124	.331
OCC6	--	--	--	--
OCC7	.084	.278	.091	.290
OCC8	--	--	--	--
OCC9	--	--	--	--
OCC10	.046	.210	.050	.219
OCC11	.105	.308	.101	.303
OCC12	--	--	--	--
OCC13	--	--	--	--
OCC14	.010	.101	.017	.131
WFAGE	29.936	5.309	--	--
EARN	.338	.475	.363	.483
WEDUC	7.477	3.950	8.005	4.029
EXAD	.814	1.535	.852	1.559

TABLE A2. *(continued)*

	Wives		Husbands	
Variable	Mean	S.D.	Mean	S.D.
URB3	.292	.456	.294	.458
URB2	.213	.411	.207	.407
	Taiwan (1,797 wives, 912 husbands)			
CINC	4.932	1.793	4.969	1.798
HSAGE	37.717	7.982	36.819	7.993
HEDUC	6.889	3.975	6.933	3.913
OCC1	.065	.246	.071	.257
OCC2	.174	.379	.213	.409
OCC3	--	--	--	--
OCC4	.044	.205	.048	.214
OCC5	.093	.290	.086	.280
OCC6	.140	.347	.137	.344
OCC7	.087	.282	.080	.271
OCC8	.059	.236	.048	.214
OCC9	.064	.245	.065	.246
OCC10	.091	.287	.071	.257
OCC11	--	--	--	--
OCC12	.141	.348	.149	.356
OCC13	--	--	--	--
OCC14	.025	.156	.015	.123
EARN	.410	.490	.397	.490
WEDUC	4.851	3.185	4.957	3.039
EXAD	1.289	2.489	1.425	2.645
URB4	.317	.465	.305	.461
URB3	.161	.368	.164	.371
URB2	.213	.409	.229	.421

TABLE A2. *(continued)*

Variable	Wives Mean	Wives S.D.	Husbands Mean	Husbands S.D.
	Singapore (814 wives, 419 husbands)			
CINC	3.656	1.533	3.854	1.662
AGE20	.027	.162	.026	.160
AGE25	.177	.382	.186	.390
AGE30	.210	.408	.210	.408
AGE35	.227	.419	.243	.430
AGE40	.195	.397	.186	.390
HEDUC	3.532	1.260	3.050	1.392
OCC1	.015	.121	.017	.128
OCC2	.054	.226	.048	.213
OCC3	.021	.143	.021	.145
OCC4	.195	.397	.191	.393
OCC5	.112	.315	.129	.335
OCC6	--	--	--	--
OCC7	.571	.495	.554	.498
HH2	.457	.498	.489	.500
EARN	.248	.432	.272	.446
WEDUC	2.957	1.323	3.582	1.296
URB3	.371	.483	.344	.475
URB2	.388	.488	.408	.492
	United States (1,324 wives, 390 husbands)			
CINC	10.698	3.430	11.133	3.429
HSAGE	31.461	6.813	31.510	6.519
HSAGESQ	1036.211	461.048	1035.279	445.686

TABLE A2. *(continued)*

Variable	Wives Mean	Wives S.D.	Husbands Mean	Husbands S.D.
HEDUC	12.925	2.669	12.969	2.846
OCC1	.191	.393	.203	.402
OCC2	.153	.360	.131	.338
OCC3	--	--	--	--
OCC4	.093	.290	.092	.290
OCC5	--	--	--	--
OCC6	.258	.437	.259	.439
OCC7	--	--	--	--
OCC8	--	--	--	--
OCC9	.181	.385	.208	.406
OCC10	--	--	--	--
OCC11	.023	.151	.021	.142
OCC12	.032	.175	.031	.173
EARN	.539	.499	.574	.495
WEDUC	12.524	2.245	12.633	2.325
URB4	.063	.244	.056	.231
URB3	.164	.370	.159	.366
URB2	.415	.493	.441	.497
REG1	.189	.392	.187	.391
REG3	.337	.473	.346	.476
REG4	.175	.380	.182	.386

Note: Dash indicates variables not defined for a subgroup, or categories with too few cases.

TABLE A3. OLS regressions for household income, by country and sex

	Wives		Husbands	
Variable	B	(S.E.)	B	(S.E.)
	Philippines			
HSAGE	.179•	(.055)	.069	(.107)
HSAGESQ	-.002•	(.001)	-.000	(.001)
HEDUC	.144•	(.030)	.051	(.067)
OCC1	3.221•	(.590)	4.495•	(1.218)
OCC2	3.739•	(.769)	--	--
OCC3	2.729•	(.856)	-.062	(1.956)
OCC4	1.866•	(.488)	3.734•	(1.115)
OCC5	1.579•	(.486)	2.946•	(1.026)
OCC6	2.365•	(.479)	4.316•	(1.080)
OCC7	1.068•	(.532)	1.827	(1.204)
OCC8	.977•	(.438)	.712	(.935)
OCC9	1.168•	(.423)	1.400	(.923)
OCC10	.563	(.503)	.129	(1.154)
OCC11	-.267	(.780)	.100	(2.306)
OCC12	2.021•	(.952)	3.877•	(1.659)
OCC13	-.059	(.391)	.404	(.848)
OCC14	.336	(.478)	-.425	(1.012)
EARN	.590•	(.152)	.477	(.332)
WEDUC	.255•	(.029)	.107	(.065)
HH2	.429•	(.198)	.564	(.435)
HH3	-.279	(.236)	.007	(.540)
URB3	.450	(.253)	.264	(.550)
URB2	1.279•	(.222)	1.749•	(.488)
REG1	-.619	(.427)	.023	(.845)
REG2	.204	(.447)	-.347	(1.023)
REG3	.017	(.344)	-.237	(.751)

TABLE A3. *(continued)*

	Wives		Husbands	
Variable	B	(S.E.)	B	(S.E.)
REG4	1.403*	(.317)	1.248	(.646)
REG5	.169	(.376)	.292	(.759)
REG6	-.752*	(.349)	-.568	(.688)
REG7	.366	(.454)	-.642	(1.002)
REG8	-.498	(.352)	-.243	(.755)
REG10	2.979*	(.567)	4.893*	(1.137)
Constant	-3.101*	(1.109)	.328	(2.250)
R^2	.465		.486	
	Turkey			
AGE20	--	--	-2.517*	(.608)
AGE25	--	--	-1.701*	(.483)
AGE30	--	--	-1.564*	(.493)
AGE35	--	--	-.761	(.507)
AGE40	--	--	-1.302*	(.539)
HEDUC	.146*	(.035)	.262*	(.063)
OCC1	1.689*	(.512)	2.208*	(.831)
OCC2	.627	(.418)	1.307	(.704)
OCC3	.063	(.602)	1.416	(1.001)
OCC4	1.389*	(.386)	1.969*	(.675)
OCC5	--	--	--	--
OCC6	.832*	(.403)	1.486*	(.691)
OCC7	.293	(.418)	1.942*	(.763)
OCC8	--	--	--	--
OCC9	.454	(.452)	1.704*	(.783)
OCC10	.143	(.410)	1.719*	(.729)
OCC11	-.742	(.542)	-.067	(.866)

TABLE A3. *(continued)*

	Wives		Husbands	
Variable	B	(S.E.)	B	(S.E.)
OCC12	.802*	(.350)	1.485*	(.595)
AGW25	.403	(.224)	--	--
AGW30	.172	(.244)	--	--
AGW35	.981*	(.225)	--	--
EARN	-.501*	(.182)	-1.002*	(.289)
WEDUC	.295*	(.033)	.298*	(.053)
EXAD	.291*	(.030)	.178*	(.058)
URB4	2.094*	(.298)	2.437*	(.484)
URB3	1.227*	(.229)	2.001*	(.395)
URB2	1.196*	(.223)	1.257*	(.354)
Constant	1.576*	(.393)	1.489*	(.708)
R^2	.293		.463	
	Indonesia			
HSAGE	--	--	.063*	(.006)
HEDUC	.124*	(.012)	.135*	(.018)
OCC1	.816*	(.151)	.858*	(.218)
OCC2	.570*	(.114)	.301	(.159)
OCC3	--	--	--	--
OCC4	.659*	(.107)	.608*	(.167)
OCC5	.571*	(.151)	.128	(.227)
OCC6	--	--	--	--
OCC7	.683*	(.157)	1.125*	(.252)
OCC8	-.488*	(.228)	-.546	(.348)
OCC9	-.010	(.107)	-.285	(.161)
WFAGE	.079*	(.005)	--	--
EARN	.162*	(.061)	.138*	(.088)

TABLE A3. *(continued)*

	Wives		Husbands	
Variable	B	(S.E.)	B	(S.E.)
WEDUC	.166*	(.014)	.153*	(.020)
URB2	-.441*	(.091)	-.615*	(.132)
REG1	-.094	(.089)	-.163	(.128)
REG2	.095	(.090)	.099	(.130)
REG3	.928	(.850)	.993*	(.122)
Constant	1.490*	(.215)	1.806*	(.305)
R^2	.601		.615	
	Korea			
HSAGE	--	--	.026*	(.010)
HEDUC	.085*	(.012)	.117*	(.019)
OCC1	.986*	(.167)	1.078*	(.281)
OCC2	.398*	(.162)	.440	(.340)
OCC3	--	--	--	--
OCC4	.557*	(.104)	.589*	(.197)
OCC5	.226	(.119)	.132	(.234)
OCC6	--	--	--	--
OCC7	.316*	(.132)	.245	(.240)
OCC8	--	--	--	--
OCC9	--	--	--	--
OCC10	-.399*	(.159)	-.570*	(.272)
OCC11	.497*	(.112)	.299	(.209)
OCC12	--	--	--	--
OCC13	--	--	--	--
OCC14	-.162	(.311)	.592	(.436)
WFAGE	.027*	(.006)	--	--
EARN	.159*	(.071)	.099	(.123)

TABLE A3. *(continued)*

	Wives		Husbands	
Variable	B	(S.E.)	B	(S.E.)
WEDUC	.125*	(.012)	.086*	(.021)
EXAD	.168*	(.021)	.124*	(.037)
URB3	.270*	(.087)	.332*	(.162)
URB2	-.092	(.087)	-.150	(.159)
Constant	.364	(.223)	.491	(.431)
R^2	.432		.450	
	Taiwan			
HSAGE	.003	(.004)	.006	(.006)
HEDUC	.087*	(.012)	.106*	(.016)
OCC1	1.305*	(.294)	1.654*	(.405)
OCC2	1.827*	(.262)	1.859*	(.367)
OCC3	--	--	--	--
OCC4	1.083*	(.292)	1.052*	(.404)
OCC5	.974*	(.274)	1.311*	(.387)
OCC6	1.042*	(.263)	1.349*	(.371)
OCC7	.582*	(.274)	.706	(.388)
OCC8	1.453*	(.282)	1.590*	(.404)
OCC9	1.061*	(.277)	1.222*	(.390)
OCC10	.485	(.267)	.372	(.384)
OCC11	--	--	--	--
OCC12	.281	(.259)	.510	(.366)
OCC13	--	--	--	--
OCC14	.744*	(.318)	.462	(.498)
EARN	.280*	(.066)	.239*	(.092)
WEDUC	.100*	(.014)	.093*	(.021)
EXAD	.143*	(.014)	.146*	(.018)

TABLE A3. *(continued)*

	Wives		Husbands	
Variable	B	(S.E.)	B	(S.E.)
URB4	.959*	(.089)	.961*	(.123)
URB3	.655*	(.103)	.532*	(.142)
URB2	.331*	(.091)	.116	(.124)
Constant	1.955*	(.313)	1.644*	(.439)
R^2	.434		.462	
	Singapore			
AGE20	-1.291*	(.296)	-1.134*	(.424)
AGE25	-.559*	(.164)	-.425	(.231)
AGE30	-.629*	(.153)	-.427	(.218)
AGE35	-.470*	(.147)	-.355	(.208)
AGE40	-.308*	(.147)	-.258	(.216)
HEDUC	.256*	(.051)	.264*	(.061)
OCC1	1.640*	(.459)	1.014	(.603)
OCC2	.476	(.327)	.303	(.447)
OCC3	2.001*	(.407)	1.790*	(.553)
OCC4	.258	(.273)	.092	(.350)
OCC5	-.049	(.292)	-.511	(.371)
OCC6	--	--	--	--
OCC7	-.270	(.258)	-.647	(.327)
HH2	.400*	(.094)	.469*	(.132)
EARN	.709*	(.105)	.823*	(.145)
WEDUC	.180*	(.046)	.264*	(.070)
URB3	-.114	(.118)	-.220	(.167)
URB2	-.183	(.115)	-.256	(.160)
Constant	2.423*	(.289)	2.499*	(.375)
R^2	.353		.456	

TABLE A3. *(continued)*

	Wives		Husbands	
Variable	B	(S.E.)	B	(S.E.)
	United States			
HSAGE	.707*	(.083)	.720*	(.178)
HSAGESQ	-.008*	(.001)	-.009*	(.003)
HEDUC	.166*	(.043)	.167*	(.080)
OCC1	1.743*	(.393)	2.783*	(.801)
OCC2	2.294*	(.373)	3.526*	(.776)
OCC3	--	--	--	--
OCC4	1.974*	(.402)	2.894*	(.810)
OCC5	--	--	--	--
OCC6	1.721*	(.333)	2.149*	(.691)
OCC7	--	--	--	--
OCC8	--	--	--	--
OCC9	1.306*	(.343)	2.491*	(.695)
OCC10	--	--	--	--
OCC11	-.152	(.579)	.299	(1.169)
OCC12	2.654*	(.526)	4.261*	(1.058)
EARN	.750*	(.156)	.696*	(.303)
WEDUC	.304*	(.046)	.243*	(.090)
URB4	.866*	(.341)	.502	(.694)
URB3	1.572*	(.246)	1.740*	(.487)
URB2	.733*	(.182)	.878*	(.347)
REG1	-.597*	(.228)	-.298	(.446)
REG3	-.468*	(.196)	-.527	(.381)
REG4	-.819*	(.231)	-1.041*	(.445)
Constant	-11.031*	(1.431)	-10.713*	(3.079)
R^2	.363		.360	

*Coefficient is at least twice its standard error.

APPENDIX B. GENERAL INDICES OF VALUES AND DISVALUES OF CHILDREN

The Value of Children data provide a number of measures of the importance placed by the respondent on many of the values and disvalues attached to children. These measures were combined to provide general indices for specific values and disvalues, chosen partly on the basis of prior empirical analysis (especially Arnold et al., 1975; Bulatao, 1975) and factor analysis of some of the measures themselves, and partly on the basis of theoretical interest. This appendix briefly describes the general indices used in this paper, as well as a few other general indices constructed concurrently but not used here.

The indices were based on the following types of value and disvalue measures: (a) ratings of reasons for wanting and not wanting another child; (b) separate rankings of these two sets of reasons; (c) ratings of reasons for having children; (d) advantages and disadvantages of having children cited in response to several open-ended questions (on general advantages and disadvantages, reasons for preferring a particular family size, reasons for wanting sons and daughters, restrictions imposed by children, and changes in a person's life from having children; (e) rankings of general disvalues of children; and (f) several miscellaneous ratings of specific values and disvalues. Table B1 lists the indices and the measures used to construct each one.

Each constituent measure was scaled so that it ranged, theoretically, from zero to one, in the process roughly equalizing the variances. The measures were then added up. The sums were checked for heteroscedasticity across all countries combined, and natural logs or roots taken where indicated. For convenience, each resulting index was scaled so that it ranged, theoretically, from 0 to 5. These calculations are summarized in Table B2.

The resulting indices were unimodal (except for GPRV) and roughly normal in distribution. The internal consistency of each index among wives in each country is indicated by an alpha coefficient in Table B3. A number of coefficients are respectable, but not as high as those sometimes obtained for psychological scales. It should be noted that each index included measures obtained by different methods, not simply by different questions using the same method. Internal consistency might be improved by selecting only those measures that correlate best with each other, but this could reduce validity.

When indices were first calculated, any index was defined as missing

TABLE B1. General value and disvalue indices and constituent measures

---

ECOV economic contributions from children

E1 deviation of item rating from mean rating across all reasons for wanting another child, for these three items (averaged):
- o to have a child to help around the house
- o to be sure that in your old age you will have someone to help you
- o so that there will be one more person to help your family economically

E2 rank assigned to above items (2 points if any item is ranked first, 1 additional point if any item is ranked second)

E3 deviation of item rating from mean rating across all reasons for having children, for these two items:
- o because children can work and help the family
- o to have someone to depend on when you are old

E4 number of open-ended questions to which "children help" is given in response, for these questions: advantages of having children, reasons for preferring not to have fewer than desired number of children, reasons for wanting a son, reasons for wanting a daughter, and changes in a person's life from having children

E5 mean rating across ten items of expected support from sons and daughters (from 3 = expects help to 1 = no help expected)

HOWV help with housework

H1 deviation of item rating from mean rating across all reasons for wanting another child, for this item:
- o to have a child to help around the house

TABLE B1. *(continued)*

H2 rank assigned to above item (2 points if ranked first, 1 point if ranked second)

H3 number of open-ended questions to which "help with housework" is given in response, for these questions: advantages of having children, reasons for preferring not to have fewer than desired number of children, reasons for wanting a son, reasons for wanting a daughter, and changes in a person's life from having children

H4 whether sons are expected to "help around the house" (from 3 = expects help to 1 = no help expected)

H5 whether daughters are expected to "help around the house" (from 3 = expects help to 1 = no help expected)

NAMV carrying on the family name

N1 deviation of item rating from mean rating across all reasons for wanting another child, for this item:
o to help carry on your family name

N2 rank assigned to above item (2 points if ranked first, 1 point if ranked second)

N3 deviation of item rating from mean rating across all reasons for having children, for this item:
o so that the family line will continue

N4 deviation of item rating from mean rating across all values important in one's life, for this item:
o passing on the family name

N5 number of open-ended questions to which "family name or line" is given in response, for these questions: advantages of having children, reasons for preferring not to have fewer than desired number of children, reasons for wanting a son, reasons for wanting a daughter, and changes in a person's life from having children

TABLE B1. *(continued)*

RELV religious obligations

R1 deviation of item rating from mean rating across all reasons for wanting another child, for this item:
- o because of your religion

R2 number of open-ended questions to which "religious duty" or "religious rituals" is given in response, for these questions: advantages of having children, reasons for preferring not to have fewer than desired number of children, reasons for wanting a son, reasons for wanting a daughter, and changes in a person's life from having children

GPRV gender preference

G1 deviation of item rating from mean rating across all reasons for wanting another child, for these two items (in this case only, the higher of the two deviations rather than their average was used):
- o because you want to have another boy
- o because you want to have another girl

G2 rank assigned to above items (2 points if either is ranked first, 1 additional point if either is ranked second)

SIBV sibling companionship

S1 deviation of item rating from mean rating across all reasons for wanting another child, for this item:
- o to provide a companion for your children

S2 rank assigned to above item (2 points if ranked first, 1 point if ranked second)

TABLE B1. *(continued)*

S3 How important is it for a child to have brothers and sisters for companionship: very important (4), somewhat important (3), slightly important (2), or not important at all (1)?

COMV companionship provided by children

C1 deviation of item rating from mean rating across all reasons for wanting another child, for these items:
- o because of the pleasure you get out of watching children grow
- o to bring your spouse and yourself closer together
- o because it is fun to have young children around the house

C2 rank assigned to above items (2 points if any is ranked first, 1 additional point if any is ranked second)

C3 deviation of item rating from mean rating across all reasons for having children, for these items:
- o so that you will not be lonely
- o because children are needed to complete the family
- o because children are fun

C4 number of open-ended questions to which "companions, playmates" is given response, for these questions: advantages of having children, reasons for preferring not to have fewer than desired number of children, reasons for wanting a son, reasons for wanting a daughter, and changes in a person's life from having children

TABLE B1. *(continued)*

FIND financial costs of children

F1 deviation of item rating from mean rating across all reasons for not wanting another child, for this item:
- o because having another child would be a financial burden for your family

F2 rank assigned to above item (2 points if ranked first, 1 point if ranked second)

F3 number of open-ended questions to which "financial demands" is given in response, for these questions: disadvantages of having children, reasons for preferring not to have more than desired number of children, and changes in a person's life from having children

F4 rank assigned to "financial problems connected with children" among four general disvalues (from 3 = most important, to 0 = least important)

AGED being too old to have children

A1 deviation of item rating from mean rating across all reasons for not wanting another child, for this item:
- o because your spouse and you are too old for another child

A2 rank assigned to above item (2 points if ranked first, 1 point if ranked second)

FRED restriction of parents' freedom

R1 deviation of item rating from mean rating across all reasons for not wanting another child, for this item:
- o because you would not be as free to do what you want to do

TABLE B1. *(continued)*

R2 rank assigned to above item (2 points if ranked first, 1 point if ranked second)

R3 number of open-ended questions to which "restrictions on parents" (excluding "wife can't work") is given in response, for these questions: disadvantages of having children, reasons for preferring not to have more than desired number of children, changes in a person's life from having children, and things children interfere with or prevent one from doing

R4 rank assigned to "children keeping you from other things you might want to do" among four general disvalues (from 3 = most important, to 0 = least important)

R5 Would you say that having children prevents you from doing other things you want to do very often (3), sometimes (2), or not at all (1)?

WRKD interference with wife's work

W1 deviation of item rating from mean rating across all reasons for not wanting another child, for this item:
- o because it would be harder for the wife to have a job

W2 rank assigned to above item (2 points if ranked first, 1 point if ranked second)

W3 number of open-ended questions to which "wife can't work" is given in response, for these questions: disadvantages of having children, reasons for preferring not to have more than desired number of children, changes in a person's life from having children, and things children interfere with or prevent one from doing

TABLE B1. *(continued)*

BURD childbearing burdens

B1 deviation of item rating from mean rating across all reasons for not wanting another child, for these items:
- o because another child would be a lot of work and bother for you
- o because you would not be able to give enough care and attention to all your children
- o because children would be hard to discipline and control

B2 rank assigned to above items (2 points if any is ranked first, 1 additional point if any is ranked second)

B3 number of open-ended questions to which "concerns about childbearing" is given in response, for these questions: disadvantages of having children, reasons for preferring not to have more than desired number of children, and changes in a person's life from having children

B4 rank assigned to "the worry and strain of childrearing" among four general disvalues (from 3 = most important, to 0 = least important)

B5 Some people say that children cause a lot of worry and emotional strain. Would you say that they cause a lot of worry and emotional strain (4), or a moderate amount of worry and strain (3), or only a little worry and strain (2), or none at all (1)?

TABLE B2. Calculation of general indices

ECOV	First calculate E: $E = \frac{E1 + 1.5}{3} + \frac{E2}{3} + \frac{19}{68}\left(E3 + \frac{34}{19}\right) + \frac{E4}{5} + \frac{E5-1}{2} - 2.4$ Then, if E is positive, $ECOV = \frac{5(E^{1.8} + 2.4^{1.8})}{2.6^{1.8} + 2.4^{1.8}}$ If E is negative, $ECOV = \frac{5[-(-E)^{1.8} + 2.4^{1.8}]}{2.6^{1.8} + 2.4^{1.8}}$
HOWV	$\frac{6}{22}\left(H1 + \frac{11}{6}\right) + \frac{H2}{2} + \frac{H3}{5} + \frac{H4}{3} + \frac{H5}{3}$
NAMV	$\frac{6}{22}\left(N1 + \frac{11}{6}\right) + \frac{N2}{2} + \frac{19}{72}\left(N3 + \frac{36}{19}\right) + \frac{9}{32}\left(N4 + \frac{16}{9}\right) + \frac{N5}{5}$
RELV	$\frac{5}{2}\left[\frac{19}{72}\left(R1 + \frac{36}{19}\right) + \frac{R2}{3}\right]$
GPRV	$5\left\{\frac{1}{2}\left[\frac{6}{22}\left(G1 + \frac{11}{6}\right) + \frac{G2}{3}\right]\right\}^{1/5}$
SIBV	$\frac{5}{\log 6} \log\left\{\frac{5}{3}\left[\frac{6}{22}\left(S1 + \frac{11}{6}\right) + \frac{S2}{2} + \frac{S3-1}{3}\right] + 1\right\}$
COMV	$\frac{5}{\log 6} \log\left\{\frac{5}{4}\left[\frac{C1 + 1.5}{3} + \frac{C2}{3} + \frac{19}{64}\left(C3 + \frac{32}{19}\right) + \frac{C4}{5}\right] + 1\right\}$
FIND	$\frac{5}{4}\left(\frac{F1 + 1.8}{3.6} + \frac{F2}{2} + \frac{F3}{3} + \frac{F4}{3}\right)$
AGED	$5\left[\frac{1}{2}\left(\frac{A1 + 1.8}{3.6} + \frac{A2}{2}\right)\right]^{1/3}$
FRED	$\frac{5}{\log 6} \log\left(\frac{R1 + 1.8}{3.6} + \frac{R2}{2} + \frac{R3}{4} + \frac{R4}{3} + \frac{R5-1}{2} + 1\right)$
WRKD	$5\left[\frac{1}{3}\left(\frac{W1 + 1.8}{3.6} + \frac{W2}{2} + \frac{W3}{4}\right)\right]^{1/3}$
BURD	$\frac{B1 + 1.4}{2.8} + \frac{B2}{3} + \frac{B3}{3} + \frac{B4}{3} + \frac{B5-1}{3}$

if one or more of its constituent measures were missing. The proportion of cases with missing data was variable–from essentially 0 percent for a number of measures to around 10 percent for a few measures. Estimates for the missing measures, based on regressions for all countries combined to predict each index from subsets of its constituent measures, were used to fill in the missing index scores.

TABLE B3. Reliability of general indices (alpha coefficients among wives, by country)

	Philippines	Turkey	Indonesia	Korea	Taiwan	Singapore	United States
ECOV	.45	.64	.48	.58	.62	.72	.53
HOWV	.35	.44	.39	.40	.56	.59	.45
NAMV	.44	.58	.36	.58	.46	.77	.69
RELV	.02	.01	.00	.07	.02	-.02	.12
GPRV	.43	.57	.49	.75	.64	.58	.64
SIBV	.23	.36	.25	.50	.27	.44	.43
COMV	.22	.42	.21	.32	.45	.45	.24
FIND	.32	.52	.37	.58	.53	.57	.69
AGED	.41	.61	.57	.50	.33	.61	.85
FRED	.15	.40	.26	.57	.35	.52	.75
WRKD	.27	.48	.32	.50	.23	.46	.60
BURD	.15	.31	.44	.31	.31	.42	.46

TABLE C1. Reduced-form regressions for desire for another child, by country and sex

Desire for Another Child: Wives

	Philippines		Turkey		Indonesia		Korea		Taiwan		Singapore		United States	
Predictor	B	(S.E.)	B	(S.E.)	B	(S.E.)	B	(S.E.)	B	(S.E.)	B	(S.E.)	B	(S.E.)
LNLC	-6.64**	(.92)	-10.20**	(.79)	-7.15**	(.73)	-10.70**	(1.13)	-10.70**	(.75)	-12.10**	(1.03)	-9.40**	(1.33)
NLC	.97**	(.20)	1.84**	(.19)	.76**	(.17)	2.14**	(.33)	2.02**	(.19)	2.55**	(.28)	2.18**	(.40)
ROLD	-.47	(.31)	-.08	(.27)	-.40	(.25)	-.69*	(.31)	-1.94**	(.24)	-1.07**	(.29)	-.50	(.35)
AGFB	.01	(.03)	-.02	(.04)	-.05	(.04)	-.12*	(.04)	-.08**	(.02)	-.12**	(.03)	.02	(.05)
MDUR	.02	(.05)	-.08	(.04)	-.03	(.04)	-.04	(.05)	.14**	(.04)	-.04	(.04)	-.21**	(.06)
PREVM	.60	(.78)	1.30*	(.47)	.09	(.26)	-1.33	(1.05)	.90	(.55)	-1.53	(1.49)	.95*	(.39)
CLOSS	.29	(.27)	-.14	(.22)	-.34	(.20)	.36	(.29)	.23	(.20)	.49	(.56)	.05	(.60)
LBOY	.02	(.07)	-.06	(.06)	.03	(.06)	-.30**	(.06)	-.27**	(.05)	-.11	(.07)	-.02	(.06)
LIMB	.44**	(.12)	.27*	(.10)	.06	(.11)	.39**	(.10)	.38**	(.08)	.47**	(.13)	.04	(.13)
PINC	-.53	(.36)	-1.23*	(.61)	1.90	(1.02)	-.56	(.83)	.01	(.11)	-.69	(.85)	.16	(.12)
WEDUC	.07	(.05)	.01	(.05)	-.10	(.06)	-.01	(.05)	-.04	(.03)	-.06	(.14)	-.14	(.09)
URBAN	-.55*	(.27)	-.28	(.26)	-.03	(.26)	-.55*	(.21)	-.38*	(.17)	-.13	(.29)	.30	(.29)
MEDIA	-.09	(.06)	-.06	(.05)	.05	(.05)	-.09	(.05)	-.06*	(.03)	-.09	(.06)	-.03	(.09)
ECOV	1.27**	(.44)	.91*	(.40)	1.68**	(.38)	.81	(.42)	.75*	(.30)	1.19*	(.47)	1.04*	(.52)
NAMV	.60	(.35)	.46	(.27)	-.14	(.27)	.67*	(.24)	.32*	(.15)	.35	(.25)	.35	(.42)
GPRV	2.13**	(.52)	1.91**	(.50)	3.26**	(.45)	.73	(.52)	1.32**	(.34)	.15	(.72)	1.09	(1.00)
COMV	.56	(.29)	-.24	(.26)	.47	(.27)	.22	(.30)	.19	(.21)	.70*	(.32)	-.23	(.37)
FIND	-.28	(.16)	-.16	(.14)	-.06	(.13)	.13	(.14)	-.09	(.08)	-.00	(.16)	.06	(.21)
FRED	-.34	(.18)	.11	(.15)	.05	(.16)	-.10	(.13)	-.00	(.10)	-.37*	(.17)	-.54*	(.19)
WRKD	.15	(.35)	-.32	(.32)	-.17	(.35)	.38	(.51)	.55	(.31)	-.67	(.43)	.46	(.51)
ECO	-1.32*	(.54)	-.16	(.38)	-1.60**	(.42)	-.42	(.43)	.00	(.30)	-1.02*	(.49)	-1.60*	(.68)
NAM	-.50	(.27)	-.09	(.23)	.13	(.25)	-.07	(.25)	-.17	(.17)	.24	(.30)	-.97*	(.35)
GPR	-.51	(.40)	-.39	(.32)	-.85*	(.35)	.06	(.35)	-.14	(.22)	.35	(.46)	.22	(.57)
COM	-.91	(.51)	.73	(.38)	-1.39**	(.42)	.15	(.45)	.17	(.28)	-1.50*	(.51)	.80	(.63)
SIB	.53*	(.25)	.52*	(.17)	.43*	(.22)	.51*	(.18)	.04	(.14)	.38	(.23)	.13	(.24)
FIN	.16	(.23)	.03	(.19)	.19	(.19)	-.70*	(.23)	.15	(.16)	-.16	(.26)	-.21	(.28)
FRE	-.08	(.21)	-.14	(.17)	-.25	(.18)	.09	(.18)	-.00	(.16)	.14	(.23)	-.38	(.25)
WRK	.11	(.33)	.24	(.28)	.21	(.31)	-.27	(.41)	-.63*	(.25)	.64	(.36)	-.41	(.41)
Constant	-2.83	(3.54)	3.55	(3.46)	-6.98	(3.57)	7.15*	(3.43)	5.45*	(2.26)	13.62*	(4.22)	3.96	(4.84)
R^2 (F)	.32	(22.73)	.41	(30.00)	.46	(48.81)	.48	(39.47)	.54	(77.65)	.59	(33.93)	.37	(21.21)

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LNLC	-3.24	(1.86)	-7.55*	(1.91)	-6.79**	(1.03)	-10.66**	(1.96)	-12.42**	(1.07)	-12.37**	(1.83)	-17.00**	(2.43)
NLC	.20	(.43)	1.25*	(.42)	.53*	(.23)	1.85**	(.54)	2.47**	(.28)	2.21**	(.52)	4.02**	(.69)
ROLD	-1.03*	(.46)	-1.21*	(.47)	-.31	(.28)	-.94*	(.47)	-1.26**	(.29)	-.88*	(.43)	.16	(.54)
AGFB	.06	(.07)	-.14*	(.06)	-.07	(.04)	-.02	(.07)	-.04	(.03)	-.14*	(.05)	.08	(.08)
MDUR	.03	(.05)	.02	(.06)	-.04	(.03)	.17*	(.08)	.06	(.04)	-.03	(.05)	-.11	(.08)
PREVM	-1.09	(1.30)	-1.30	(.94)	.23	(.35)	-1.96	(1.05)	-.98	(.67)	3.96*	(1.98)	-.27	(.83)
CLOSS	1.15	(.60)	-.22	(.55)	.01	(.28)	-.23	(.54)	.37	(.30)	1.34	(.98)	.48	(1.28)
LBOY	.19	(.14)	-.28*	(.14)	-.03	(.08)	-.24*	(.12)	-.24**	(.06)	.02	(.11)	-.00	(.13)
LIMB	.88*	(.27)	.00	(.28)	.13	(.16)	.66*	(.19)	.22*	(.11)	.16	(.21)	-.25	(.26)
PINC	.58	(.75)	.48	(.88)	.93	(1.35)	-.92	(1.24)	-.19	(.15)	1.50	(1.25)	-.23	(.21)
WEDUC	.02	(.09)	-.03	(.10)	-.11	(.08)	-.09	(.08)	-.05	(.05)	-.53*	(.24)	-.00	(.16)
URBAN	-.69	(.61)	.45	(.62)	-.64	(.39)	-.67	(.38)	-.10	(.23)	.41	(.49)	1.35*	(.58)
MEDIA	-.04	(.12)	-.04	(.15)	.03	(.07)	-.05	(.11)	-.03	(.04)	.07	(.12)	.03	(.19)
ECOV	1.71	(.95)	-.39	(.86)	2.34**	(.54)	-.62	(.68)	1.31**	(.38)	1.56*	(.75)	.56	(1.03)
NAMV	.44	(.67)	.39	(.60)	.58	(.39)	1.25*	(.39)	.50*	(.22)	.24	(.41)	.43	(.75)
GPRV	3.04*	(1.01)	.12	(1.38)	3.38**	(.66)	1.48	(.99)	.97	(.50)	.47	(1.32)	3.48	(1.94)
COMV	.14	(.66)	.01	(.62)	.68	(.38)	.56	(.50)	-.32	(.31)	-.90	(.59)	-.23	(.71)
FIND	-.59	(.34)	.35	(.34)	-.32	(.19)	-.50	(.27)	-.09	(.13)	.39	(.27)	-.18	(.46)
FRED	.35	(.35)	.19	(.35)	.22	(.23)	.24	(.24)	.24	(.14)	-.64*	(.30)	-.31	(.39)
WRKD	-.26	(.69)	.14	(.80)	.43	(.54)	.26	(1.13)	.25	(.45)	1.17	(1.27)	-1.38	(1.45)
ECO	-1.15	(1.10)	.28	(.92)	-1.11	(.64)	-.34	(.80)	-.39	(.45)	-.28	(.86)	-.56	(1.30)
NAM	-.48	(.64)	.01	(.63)	.20	(.37)	-1.05*	(.42)	-.46	(.25)	-.16	(.51)	-.79	(.73)
GPR	-1.14	(.84)	.51	(.85)	-.73	(.53)	-.20	(.61)	.11	(.32)	.50	(.81)	3.48*	(1.23)
COM	.29	(1.13)	-.05	(.93)	-.51	(.61)	-.73	(.77)	.37	(.41)	1.27	(.92)	1.39	(1.15)
SIB	.49	(.52)	.90*	(.43)	.32	(.30)	.21	(.35)	.05	(.21)	.27	(.37)	.49	(.47)
FIN	.29	(.57)	-.42	(.46)	-.06	(.27)	.26	(.42)	-.22	(.24)	-.73	(.41)	-.24	(.63)
FRE	-.27	(.47)	-.11	(.43)	-.20	(.26)	.10	(.34)	-.34	(.19)	.34	(.39)	-.36	(.49)
WRK	-.19	(.66)	-.20	(.73)	-.39	(.46)	.22	(.91)	-.24	(.39)	-1.00	(1.04)	.72	(1.11)
Constant	-7.03	(7.02)	10.75	(7.90)	-9.99*	(4.64)	4.94	(6.22)	5.21	(3.10)	9.06	(7.64)	28.11*	(10.46)
R^2 (F)	.47	(8.55)	.47	(6.6_)	.47	(24.33)	.51	(12.29)	.54	(34.42)	.56	(13.07)	.40	(6.14)

TABLE C2. Reduced-form regressions for ideal family size, by country and sex

Ideal Family Size: Wives

	Philippines		Turkey		Indonesia		Korea		Taiwan		Singapore		United States	
Predictor	B	(S.E.)	B	(S.E.)	B	(S.E.)	B	(S.E.)	B	(S.E.)	B	(S.E.)	B	(S.E.)
LNLC	3.16**	(.73)	-.35	(.70)	2.67**	(.48)	.27	(.77)	-.01	(.50)	1.82*	(.74)	-.61	(1.25)
NLC	.10	(.16)	.49*	(.16)	.12	(.11)	.52*	(.23)	.61**	(.13)	.65*	(.20)	1.60**	(.38)
ROLD	-.44	(.25)	.05	(.24)	-.53*	(.16)	-.45*	(.21)	-.40*	(.16)	-.86**	(.21)	-.05	(.33)
AGFB	.05*	(.03)	.06	(.03)	-.05	(.02)	-.01	(.03)	.03*	(.02)	-.07*	(.02)	.05	(.05)
MDUR	.03	(.04)	-.00	(.04)	.07*	(.02)	.07*	(.03)	.05	(.03)	.08*	(.03)	-.10	(.06)
PREVM	.15	(.62)	-.15	(.42)	-.50*	(.17)	-.77	(.72)	-.12	(.36)	-.66	(1.07)	-.85*	(.36)
CLOSS	.56*	(.21)	.34	(.19)	.01	(.13)	.54*	(.20)	.12	(.13)	.23	(.40)	.44	(.56)
LBOY	-.04	(.05)	.05	(.05)	.05	(.04)	-.10*	(.04)	[illegible]	(.03)	-.01	(.05)	-.02	(.06)
LIMB	-.00	(.10)	-.09	(.09)	.02	(.07)	-.10	(.07)	[illegible]	(.05)	.09	(.09)	.07	(.12)
PINC	.11	(.29)	-.72	(.54)	.58	(.67)	-.62	(.57)	-.11	(.07)	-.45	(.61)	.06	(.12)
WEDUC	-.08*	(.04)	-.06	(.04)	-.05	(.04)	-.04	(.04)	-.03	(.02)	.11	(.10)	-.04	(.09)
URBAN	-.80**	(.22)	.51*	(.23)	-.24	(.17)	-.04	(.14)	-.47**	(.11)	-.36	(.21)	-.15	(.28)
MEDIA	-.02	(.05)	-.10*	(.04)	-.02	(.03)	-.04	(.04)	-.08**	(.02)	-.07	(.05)	.01	(.09)
ECOV	.77*	(.35)	-.11	(.35)	.80*	(.25)	.74*	(.29)	.82**	(.20)	.93*	(.33)	.13	(.49)
NAMV	.30	(.28)	.02	(.24)	-.33	(.18)	.84**	(.17)	.41**	(.10)	.45*	(.18)	.29	(.39)
GPRV	-.11	(.42)	.28	(.44)	.29	(.29)	1.19**	(.35)	.42	(.23)	.15	(.52)	-1.40	(.94)
COMV	.11	(.23)	-.30	(.23)	-.07	(.18)	.73**	(.20)	-.21	(.14)	.18	(.23)	.72*	(.34)
FIND	-.29*	(.13)	-.18	(.12)	-.23	(.08)	-.12	(.10)	-.10	(.06)	-.15	(.12)	-.43*	(.20)
FRED	-.27	(.14)	-.05	(.13)	-.06	(.10)	-.04	(.09)	-.04	(.07)	-.40*	(.12)	-.99**	(.18)
WRKD	.31	(.28)	-.09	(.28)	-.10	(.23)	-.04	(.35)	.11	(.20)	-.50	(.31)	.01	(.48)
ECO	-1.52**	(.43)	.20	(.34)	-1.17**	(.28)	-.45	(.29)	-.16	(.20)	-.11	(.35)	-1.59*	(.64)
NAM	-.55*	(.22)	-.05	(.20)	-.12	(.17)	-.63**	(.17)	-.26*	(.11)	-.21	(.21)	.30	(.33)
GPR	-.13	(.32)	.12	(.28)	-.06	(.23)	-.48*	(.34)	-.06	(.15)	.06	(.33)	.60	(.53)
COM	-.75	(.41)	.07	(.33)	-.94**	(.28)	-.27	(.31)	.10	(.19)	-.39	(.36)	-.72	(.59)
SIB	-.24	(.20)	.36*	(.15)	.08	(.14)	.16	(.12)	.10	(.09)	.30	(.16)	-.18	(.23)
FIN	-.01	(.18)	-.09	(.17)	.26*	(.13)	-.16	(.15)	.11	(.11)	.27	(.19)	.21	(.27)
FRE	-.01	(.17)	-.21	(.15)	.04	(.12)	-.01	(.12)	.08	(.11)	-.02	(.17)	.09	(.23)
WRK	-.02	(.26)	.05	(.25)	-.10	(.21)	.06	(.28)	-.11	(.17)	.58*	(.26)	-.25	(.39)
Constant	7.55*	(2.82)	10.95**	(3.07)	10.87**	(2.36)	8.34**	(2.34)	14.15**	(1.50)	17.95*	(3.03)	19.52**	(4.55)
R^2 (F)	.25	(16.04)	.14	(7.24)	.26	(20.58)	.23	(13.24)	.31	(29.45)	.49	(22.62)	.20	(8.84)

Ideal Family Size: Husbands

LNLC	2.17	(1.54)	1.98	(1.62)	3.13**	(.74)	-.75	(1.61)	.29	(.80)	.18	(1.25)	-3.94*	(1.99)
NLC	.35	(.36)	.08	(.35)	-.13	(.16)	.42	(.44)	.45*	(.21)	1.15*	(.35)	2.51**	(.57)
ROLD	.05	(.38)	-1.09*	(.40)	-.28	(.20)	-.40	(.39)	-.19	(.22)	-.19	(.29)	.70	(.45)
AGFB	-.05	(.05)	-.04	(.05)	.01	(.03)	.07	(.06)	.00	(.02)	-.06	(.04)	.16*	(.07)
MDUR	-.04	(.04)	.12*	(.05)	.02	(.02)	.13*	(.06)	.02	(.03)	-.01	(.04)	-.10	(.07)
PREVM	.19	(1.08)	-.97	(.79)	-.52*	(.25)	.01	(.87)	-.10	(.50)	1.26	(1.35)	.19	(.68)
CLOSS	.76	(.50)	.49	(.47)	.09	(.20)	.19	(.44)	-.16	(.23)	1.58*	(.67)	.14	(1.05)
LBOY	.21	(.12)	-.08	(.12)	.04	(.06)	.14	(.10)	.09	(.05)	.15	(.08)	-.04	(.10)
LIMB	.25	(.23)	-.18	(.23)	.17	(.11)	-.03	(.16)	-.28**	(.08)	.25	(.14)	-.12	(.21)
PINC	.46	(.62)	.85	(.75)	.23	(.97)	1.25	(1.02)	-.00	(.12)	-.10	(.86)	-.25	(.17)
WEDUC	-.00	(.07)	-.12	(.09)	.00	(.05)	-.06	(.06)	-.02	(.04)	-.06	(.16)	-.05	(.13)
URBAN	-.82	(.50)	-.42	(.53)	-.22	(.28)	-.15	(.31)	-.57*	(.18)	-.02	(.34)	.77	(.48)
MEDIA	-.21*	(.10)	.03	(.12)	-.03	(.05)	-.13	(.09)	-.10*	(.03)	-.03	(.08)	-.01	(.15)
ECOV	1.94*	(.78)	.49	(.73)	1.50**	(.39)	.35	(.56)	1.16**	(.29)	1.53*	(.51)	.09	(.84)
NAMV	.13	(.56)	.30	(.51)	.60*	(.28)	.73*	(.32)	.23	(.17)	.62*	(.28)	.88	(.61)
GPRV	1.06	(.84)	.15	(1.17)	.50	(.48)	.58	(.82)	.56	(.37)	.75	(.90)	.43	(1.59)
COMV	.45	(.55)	-.18	(.52)	.36	(.27)	.56	(.41)	-.04	(.23)	.14	(.41)	.63	(.58)
FIND	.31	(.28)	-.44	(.29)	-.11	(.14)	.17	(.22)	-.17	(.10)	-.19	(.19)	.05	(.37)
FRED	-.20	(.29)	-.13	(.29)	.17	(.17)	.26	(.20)	-.10	(.10)	-.49*	(.20)	-.26	(.32)
WRKD	.90	(.57)	-1.10	(.68)	.17	(.39)	.27	(.93)	.09	(.34)	-2.46*	(.87)	-1.51	(1.19)
ECO	2.17*	(.91)	.20	(.78)	-1.08*	(.46)	-.08	(.66)	-.01	(.34)	.19	(.58)	-2.00	(1.07)
NAM	-.48	(.53)	-.06	(.53)	-.43	(.26)	-.28	(.35)	-.09	(.19)	-.55	(.35)	-.61	(.60)
GPR	-.98	(.70)	.34	(.72)	-.34	(.38)	-.26	(.50)	.10	(.24)	-.12	(.56)	.02	(1.01)
COM	-.73	(.93)	.19	(.79)	-.95*	(.44)	-1.10	(.63)	.25	(.31)	.29	(.63)	.41	(.94)
SIB	.40	(.43)	.05	(.37)	-.19	(.21)	-.34	(.29)	.43*	(.16)	.48	(.25)	.24	(.39)
FIN	-.21	(.48)	.24	(.39)	-.20	(.20)	.12	(.35)	.02	(.18)	-.12	(.28)	-.19	(.52)
FRE	-.60	(.39)	.35	(.36)	.26	(.19)	-.25	(.28)	-.14	(.14)	.09	(.27)	-.09	(.40)
WRK	-1.31	(.55)	.89	(.62)	-.04	(.33)	.03	(.75)	.04	(.29)	1.78*	(.71)	1.53	(.91)
Constant	-2.20	(5.83)	12.84	(6.70)	2.99	(3.33)	6.32	(5.11)	13.40**	(2.33)	18.49**	(5.22)	12.76	(8.59)
R^2 (F)	.32	(4.49)	.21	(2.04)	.16	(5.43)	.17	(2.45)	.27	(10.85)	.48	(9.74)	.35	(5.60)

TABLE D1. Two-stage least squares regressions for desire for another child and ideal family size, by country, sex, and number of living children

	Philippines		Turkey		Indonesia		Korea		Taiwan		Singapore		United States	
Predictor	B	(S.E.)	B	(S.E.)	B	(S.E.)	B	(S.E.)	B	(S.E.)	B	(S.E.)	B	(S.E.)
	Desire for Another Child: Wives with No Living Children													
MDUR	.00	(.04)	-.01	(.03)	.05	(.03)	-.06	(.06)	--	--	-.23	(.17)	-.04	(.06)
PINC	-.94	(.60)	-.18	(1.00)	.56	(1.85)	-.18	(1.49)	--	--	-4.15	(3.62)	.13	(.18)
WEDUC	.19*	(.08)	.05	(.07)	-.01	(.11)	.03	(.11)	--	--	.35	(.65)	-.16	(.12)
IFS	.21*	(.08)	.30	(.16)	.37**	(.06)	.44*	(.17)	--	--	.42	(.38)	.64**	(.13)
ECO	-2.19*	(.86)	.38	(.56)	3.71*	(1.16)	.26	(.43)	--	--	-2.99	(1.69)	-.46	(.81)
NAM	-.58	(.36)	-.15	(.26)	.27	(.81)	.30	(.28)	--	--	1.10	(.87)	-.36	(.37)
GPR	-1.99*	(.65)	.73*	(.34)	1.27*	(.57)	-.07	(.28)	--	--	.11	(1.10)	.43	(.35)
COM	-2.41*	(.78)	1.20*	(.58)	5.80*	(1.61)	.87	(.64)	--	--	-2.41	(1.91)	.68	(.78)
FIN	-.32	(.32)	-.13	(.24)	.18	(.30)	.39	(.28)	--	--	-.39	(.88)	.02	(.24)
FRE	-.53	(.39)	.41	(.26)	.09	(.42)	.11	(.26)	--	--	-1.46	(1.10)	.07	(.26)
WRK	.19	(.41)	.05	(.27)	.01	(.52)	-.13	(.29)	--	--	.30	(.85)	.17	(.28)
Constant	8.55**	(1.59)	6.13*	(2.30)	3.31	(3.19)	2.52	(4.03)	--	--	8.04	(9.74)	-1.44	(2.87)
R^2 (F)	.61	(6.83)	.14	(1.74)	.68	(8.42)	.21	(1.45)	--	--	.32	(1.67)	.27	(6.61)

Desire for Another Child: Husbands with No Living Children

MDUR	--	--	-.07	(.12)	--	--	--	--	--	--	-.19	(.21)	-.15*	(.07)
PINC	--	--	.16	(.93)	--	--	--	--	--	--	-4.01	(3.75)	.17	(.18)
WEDUC	--	--	-.00	(.12)	--	--	--	--	--	--	1.35	(.62)	-.24	(.15)
IFS	--	--	.31	(.20)	--	--	--	--	--	--	.84	(.56)	.50*	(.14)
ECO	--	--	-.14	(1.58)	--	--	--	--	--	--	.62	(1.74)	-.29	(1.33)
NAM	--	--	-1.40	(.91)	--	--	--	--	--	--	.06	(1.29)	-.05	(.46)
GPR	--	--	-.61	(.98)	--	--	--	--	--	--	1.76	(1.37)	-.27	(.59)
COM	--	--	-.70	(1.69)	--	--	--	--	--	--	.81	(2.10)	.15	(1.11)
FIN	--	--	-2.62*	(.78)	--	--	--	--	--	--	-1.46	(1.03)	.26	(.32)
FRE	--	--	.23	(.64)	--	--	--	--	--	--	-1.32	(.89)	-.05	(.34)
WRK	--	--	-.24	(.69)	--	--	--	--	--	--	-.71	(1.22)	.04	(.33)
Constant	--	--	6.58	(3.73)	--	--	--	--	--	--	-3.98	(11.74)	2.59	(3.12)
R^2(F)	--	--	.60	(3.08)	--	--	--	--	--	--	.70	(2.33)	.59	(6.74)

TABLE D1. *(continued)*

	Philippines		Turkey		Indonesia		Korea		Taiwan		Singapore		United States	
Predictor	B	(S.E.)	B	(S.E.)	B	(S.E.)	B	(S.E.)	B	(S.E.)	B	(S.E.)	B	(S.E.)
	Desire for Another Child: Wives with One Living Child													
ROLD	-.13	(.70)	.65	(.59)	-.07	(.36)	.72	(.63)	-.32	(.49)	.08	(.97)	-.08	(.49)
AGFB	-.00	(.08)	.10	(.10)	.05	(.06)	.03	(.09)	.10	(.06)	.02	(.12)	.11	(.09)
MDUR	-.02	(.13)	-.36*	(.13)	-.02	(.08)	-.40*	(.14)	-.23*	(.11)	-.08	(.15)	-.40*	(.11)
PREVM	3.34	(2.97)	2.10	(1.84)	.24	(.50)	-6.62*	(2.69)	4.57*	(1.66)	-11.16*	(5.06)	.44	(.77)
CLOSS	-1.28	(.97)	-.17	(1.01)	-.37	(.38)	-1.49	(1.08)	-.39	(.96)	4.73*	(2.35)	.74	(1.27)
LBOY	-.03	(.12)	.20	(.12)	-.12	(.07)	.16	(.11)	-.12	(.07)	.12	(.14)	.01	(.08)
PINC	-.38	(1.08)	-2.54	(2.01)	-1.27	(1.91)	-2.07	(2.69)	-.28	(.26)	1.19	(2.94)	.55*	(.22)
WEDUC	.29	(.17)	-.05	(.18)	.06	(.11)	.11	(.17)	.02	(.08)	-.31	(.45)	-.35*	(.17)
IFS	.96*	(.40)	.01	(.46)	.74*	(.24)	1.48*	(.41)	.45*	(.18)	1.17*	(.52)	.05	(.23)
ECO	-1.51	(1.84)	-1.00	(.91)	1.14	(1.04)	-.37	(.91)	-.99	(.73)	.40	(1.28)	-.33	(1.08)
NAM	-1.70*	(.86)	.46	(.47)	-.14	(.42)	.51	(.44)	-.67	(.36)	.43	(.58)	-.61	(.50)
GPR	1.06	(1.04)	.30	(.53)	1.17*	(.49)	.32	(.45)	.57	(.37)	.33	(.75)	.40	(.42)
COM	-3.00	(1.87)	.32	(.96)	1.90	(1.30)	1.36	(1.00)	.07	(.72)	-.18	(1.39)	.36	(1.09)
SIB	.73	(.97)	.46	(.51)	1.25*	(.52)	.92	(.49)	.37	(.39)	.55	(.81)	.86	(.46)
FIN	-.37	(.55)	-.19	(.46)	-.32	(.25)	.42	(.41)	.48	(.31)	.42	(.60)	-.18	(.29)
FRE	-.69	(.65)	.44	(.51)	-.18	(.32)	-.30	(.40)	-.13	(.40)	.36	(.61)	-.98*	(.45)
WRK	-.57	(.68)	-.54	(.46)	.24	(.33)	.20	(.40)	-.26	(.28)	.59	(.65)	-.34	(.31)
Constant	-3.61	(6.63)	11.31	(6.03)	1.11	(4.79)	-14.56	(8.60)	1.19	(4.05)	-12.53	(12.67)	3.93	(4.63)
R^2 (F)	.25	(2.73)	.13	(1.86)	.19	(2.76)	.27	(4.10)	.26	(3.50)	.27	(2.47)	.24	(4.86)

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ROLD	-1.25	(.91)	-1.04	(1.20)	-.61	(.40)	--	--	-1.18	(1.11)	--	--	-.21	(.81)
AGFB	.01	(.11)	.02	(.13)	.08	(.10)	--	--	.03	(.10)	--	--	.07	(.14)
MDUR	.04	(.10)	-.05	(.14)	.04	(.06)	--	--	-.08	(.30)	--	--	.00	(.19)
PREVM	1.34	(3.20)	.02	(2.71)	.35	(.95)	--	--	2.99	(10.46)	--	--	1.12	(1.84)
CLOSS	4.92	(2.42)	-2.31	(1.79)	-.18	(.67)	--	--	-.68	(1.24)	--	--	1.03	(2.37)
LBOY	-.09	(.24)	-.33	(.29)	-.09	(.11)	--	--	-.18	(.10)	--	--	-.03	(.21)
PINC	2.88	(1.75)	-.56	(1.49)	5.36	(3.69)	--	--	.26	(.42)	--	--	.30	(.43)
WEDUC	-.28	(.23)	.17	(.26)	-.34	(.19)	--	--	-.05	(.13)	--	--	-.18	(.38)
IFS	.36	(.33)	.91	(.58)	.18	(.42)	--	--	.48	(.27)	--	--	.20	(.41)
ECO	2.03	(2.69)	-3.01	(2.06)	1.86	(1.35)	--	--	-.68	(.91)	--	--	-.66	(3.02)
NAM	-2.65	(1.81)	-1.28	(1.15)	1.76*	(.75)	--	--	.63	(.47)	--	--	.11	(1.17)
GPR	.66	(1.83)	.26	(1.16)	1.01	(1.10)	--	--	-.47	(.55)	--	--	-.29	(1.29)
COM	.39	(2.82)	-3.13	(1.97)	1.67	(1.65)	--	--	.67	(.88)	--	--	-2.77	(2.65)
SIB	-.83	(1.15)	-.62	(1.02)	-.68	(.77)	--	--	.57	(.50)	--	--	1.13	(1.04)
FIN	-2.10	(1.16)	.45	(1.12)	-.37	(.47)	--	--	.08	(.41)	--	--	-.39	(.59)
FRE	-1.39	(.95)	.31	(1.36)	-.49	(.54)	--	--	.23	(.46)	--	--	-1.35	(.74)
WRK	-.54	(1.17)	.02	(1.27)	.89	(.60)	--	--	.47	(.43)	--	--	-1.02	(.91)
Constant	.24	(6.05)	1.25	(8.31)	-1.81	(5.69)	--	--	.92	(5.84)	--	--	2.88	(8.05)
R^2 (F)	.44	(1.26)	.68	(3.20)	.27	(1.89)	--	--	.43	(2.88)	--	--	.29	(1.29)

TABLE D1. *(continued)*

	Philippines		Turkey		Indonesia		Korea		Taiwan		Singapore		United States	
Predictor	B	(S.E.)	B	(S.E.)	B	(S.E.)	B	(S.E.)	B	(S.E.)	B	(S.E.)	B	(S.E.)
	Desire for Another Child: Wives with Two Living Children													
ROLD	-.80	(.78)	.03	(.69)	-.81	(.65)	-.39	(.69)	-1.92*	(.85)	-.41	(.80)	-.15	(.69)
AGFB	.05	(.08)	-.01	(.09)	-.04	(.08)	-.19*	(.09)	-.13	(.07)	-.15	(.10)	.07	(.09)
MDUR	.12	(.15)	-.18	(.10)	.08	(.10)	-.08	(.13)	.02	(.16)	-.03	(.12)	-.24*	(.12)
PREVM	4.07	(3.30)	1.23	(1.28)	-.45	(.66)	--	--	9.09*	(2.95)	--	--	2.40*	(.73)
CLOSS	.42	(.92)	-.39	(.61)	-.52	(.48)	1.56	(.98)	1.09	(.87)	-.55	(2.76)	-1.13	(1.36)
LBOY	.09	(.14)	-.25	(.14)	-.03	(.11)	-.24	(.14)	-.34*	(.13)	-.14	(.16)	-.02	(.11)
LIMB	.41	(.22)	-.01	(.21)	-.09	(.17)	.28	(.17)	.17	(.18)	.27	(.24)	.01	(.18)
PINC	-1.52	(.87)	.50	(2.61)	2.18	(2.18)	-1.32	(1.95)	.28	(.32)	-1.33	(2.18)	.06	(.23)
WEDUC	.23*	(.12)	-.00	(.13)	.02	(.13)	.02	(.13)	-.06	(.10)	-.13	(.39)	-.16	(.17)
IFS	.97*	(.42)	1.40*	(.53)	1.42*	(.47)	1.01*	(.35)	1.82**	(.38)	1.45*	(.54)	.73	(.40)
ECO	-2.25	(1.38)	1.09	(1.07)	-1.46	(.94)	.73	(.95)	-.83	(1.01)	-2.22*	(1.05)	-.58	(1.14)
NAM	-.12	(.58)	.33	(.47)	.38	(.57)	.72	(.38)	.10	(.41)	1.03	(.54)	-.93*	(.42)
GPR	.99	(.71)	.53	(.49)	1.15*	(.58)	.96*	(.37)	.47	(.48)	-.03	(.57)	1.03*	(.39)
COM	-2.56*	(1.18)	.14	(.89)	.47	(1.21)	.46	(.91)	-.96	(.81)	-1.13	(1.17)	-.14	(1.02)
SIB	.33	(.70)	-.05	(.47)	-.22	(.61)	.27	(.43)	-1.14*	(.48)	-.12	(.58)	-.34	(.41)
FIN	.28	(.50)	-.20	(.36)	.35	(.38)	-.71	(.39)	-.16	(.40)	-.14	(.56)	-.05	(.28)
FRE	-.68	(.56)	-.05	(.44)	-.01	(.40)	.46	(.34)	.29	(.45)	.15	(.52)	-.59	(.34)
WRK	-.26	(.53)	-.25	(.38)	-.47	(.42)	.12	(.35)	-.34	(.34)	-.26	(.46)	.44	(.35)
Constant	-5.34	(5.13)	-11.26	(9.41)	-13.76	(8.87)	-6.16	(7.49)	-21.67*	(7.71)	-15.70	(12.68)	-6.57	(6.56)
R^2 (F)	.18	(3.37)	.13	(2.72)	.28	(6.38)	.22	(5.83)	.33	(8.93)	.34	(4.92)	.21	(5.45)

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ROLD	1.42	(1.47)	-.94	(1.09)	-.19	(.77)	-1.71	(1.49)	.00	(1.30)	-.25	(1.22)	1.84	(.99)
AGFB	-.02	(.15)	-.14	(.14)	-.14	(.10)	.07	(.23)	.02	(.10)	-.13	(.18)	.21	(.16)
MDUR	-.25	(.29)	-.19	(.20)	-.08	(.09)	.25	(.26)	-.25	(.24)	.11	(.16)	-.42*	(.15)
PREVM	--	--	-.25	(1.98)	1.21	(.83)	--	--	3.15	(5.07)	--	--	.39	(1.61)
CLOSS	-1.12	(1.48)	.07	(1.50)	.18	(.65)	-1.45	(2.34)	2.42	(1.45)	2.88	(2.68)	-2.63	(2.33)
LBOY	.00	(.24)	.09	(.31)	.02	(.14)	-.38	(.28)	-.40*	(.19)	.10	(.24)	-.29	(.19)
LIMB	1.70*	(.45)	-.12	(.52)	-.17	(.24)	.55	(.37)	.43	(.33)	-.08	(.37)	-.21	(.33)
PINC	-1.76	(1.72)	2.36	(2.11)	.19	(2.35)	-2.78	(3.29)	.21	(.43)	-1.80	(3.12)	-.60	(.35)
WEDUC	.11	(.20)	-.17	(.24)	-.07	(.15)	-.03	(.20)	.04	(.17)	-.33	(.62)	.18	(.24)
IFS	1.27**	(.30)	.78	(.57)	.76	(.41)	.41	(.68)	1.96*	(.55)	1.51*	(.49)	.34	(.66)
ECO	1.44	(2.78)	-.37	(2.00)	-.70	(1.46)	-2.43	(1.88)	-2.19	(1.52)	-.18	(1.96)	-.74	(1.64)
NAM	.75	(1.17)	.30	(1.18)	-.17	(.70)	-.46	(.84)	-.35	(.59)	1.77*	(.85)	-.69	(.85)
GPR	.79	(1.37)	1.21	(.93)	2.29*	(.73)	.50	(.83)	1.13	(.78)	2.09*	(.87)	1.86	(1.08)
COM	.76	(2.39)	-.34	(2.04)	.41	(1.40)	-.19	(1.85)	-1.54	(1.21)	.69	(1.99)	1.53	(2.03)
SIB	1.08	(1.26)	1.40	(1.10)	-.01	(.63)	.36	(.93)	-1.33	(.68)	1.10	(1.16)	-.52	(.77)
FIN	-.43	(1.13)	-.64	(.80)	-.17	(.54)	.22	(.77)	-.34	(.65)	.10	(.71)	.07	(.54)
FRE	1.22	(1.26)	-.07	(1.22)	.07	(.53)	-.67	(.99)	.07	(.57)	-.09	(.82)	-.16	(.64)
WRK	-.57	(1.11)	-.77	(1.15)	-.30	(.53)	.14	(1.16)	-.01	(.54)	-1.29	(.99)	-.32	(.57)
Constant	-9.66	(5.71)	-2.02	(8.10)	1.16	(8.77)	.95	(12.77)	-30.72*	(11.80)	-17.63	(12.44)	-4.49	(11.34)
R^2 (F)	.61	(3.83)	.39	(1.48)	.26	(2.63)	.21	(1.14)	.38	(5.00)	.39	(2.99)	.26	(2.01)

TABLE D1. *(continued)*

Predictor	Philippines B	Philippines (S.E.)	Turkey B	Turkey (S.E.)	Indonesia B	Indonesia (S.E.)	Korea B	Korea (S.E.)	Taiwan B	Taiwan (S.E.)	Singapore B	Singapore (S.E.)	United States B	United States (S.E.)
	Desire for Another Child: Wives with Three Living Children													
ROLD	-.26	(1.07)	-.71	(.72)	-.45	(.81)	.66	(.71)	-.47	(.57)	-.26	(.63)	.51	(1.10)
AGFB	.00	(.11)	-.02	(.09)	.03	(.11)	.03	(.08)	-.10*	(.04)	.01	(.06)	.08	(.13)
MDUR	-.17	(.18)	-.02	(.10)	-.06	(.12)	-.20*	(.10)	-.02	(.09)	-.10	(.08)	-.39*	(.17)
PREVM	1.23	(3.01)	2.76*	(1.14)	1.05	(.87)	1.03	(1.63)	.15	(1.26)	--	--	-.21	(1.03)
CLOSS	-.38	(.96)	-.02	(.47)	-.22	(.61)	-.41	(.54)	-.63	(.35)	.80	(1.08)	.42	(1.23)
LBOY	-.15	(.21)	-.30	(.16)	.28	(.20)	-.79**	(.14)	-.76**	(.09)	-.37*	(.15)	-.14	(.24)
LIMB	.42	(.29)	.46*	(.21)	.02	(.26)	.68*	(.20)	.73**	(.12)	.36	(.21)	-.30	(.33)
PINC	-.19	(.92)	-.35	(1.29)	2.19	(2.95)	-2.45	(1.47)	-.01	(.15)	.84	(1.65)	-.08	(.33)
WEDUC	-.15	(.13)	.03	(.10)	.01	(.20)	.10	(.09)	-.02	(.05)	-.38	(.25)	-.29	(.25)
IFS	-.25	(.71)	-.49	(.37)	1.80*	(.58)	.77*	(.35)	.44	(.31)	.51	(.36)	-.36	(.41)
ECO	.65	(1.27)	.27	(.73)	.85	(1.36)	1.18	(.80)	1.25*	(.44)	-.08	(.65)	-2.06	(1.67)
NAM	.85	(.66)	-.17	(.38)	1.62*	(.82)	.65	(.34)	-.02	(.21)	.38	(.36)	-.48	(.62)
GPR	1.07	(.65)	.46	(.36)	1.97*	(.57)	.55	(.34)	.41*	(.20)	.58	(.35)	1.23*	(.54)
COM	.36	(1.25)	.19	(.65)	.16	(1.53)	.36	(.77)	1.15*	(.42)	.34	(.71)	1.19	(1.28)
SIB	1.51*	(.73)	.95*	(.48)	-.46	(.63)	.58	(.33)	.25	(.22)	.26	(.39)	.19	(.59)
FIN	-.92	(.72)	-.11	(.35)	.28	(.46)	-.59*	(.29)	.05	(.22)	-.54	(.38)	-.57	(.46)
FRE	.77	(.57)	-.76	(.41)	-.77	(.49)	-.18	(.28)	.00	(.31)	-.03	(.34)	-1.25*	(.58)
WRK	.15	(.63)	.05	(.31)	.43	(.55)	-.25	(.27)	-.04	(.18)	-.09	(.32)	-.50	(.45)
Constant	9.34	(10.21)	9.10	(5.46)	-24.62*	(10.02)	-9.50	(8.41)	-3.82	(6.04)	-7.62	(7.42)	13.54	(8.06)
R^2 (F)	.11	(1.66)	.12	(1.92)	.20	(4.10)	.26	(5.95)	.29	(12.30)	.23	(2.63)	.19	(2.36)

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ROLD	-.73	(1.20)	.81	(1.57)	1.05	(.93)	-1.28	(1.14)	-.73	(.50)	.58	(.78)	-1.29	(1.33)
AGFB	-.05	(.23)	-.10	(.23)	-.09	(.15)	-.03	(.11)	-.01	(.05)	.10	(.08)	-.15	(.19)
MDUR	.21	(.12)	-.07	(.18)	-.21	(.11)	.12	(.18)	.03	(.07)	.01	(.12)	.17	(.16)
PREVM	--	--	-2.26	(6.13)	2.72	(1.49)	2.71	(2.45)	-.71	(1.07)	--	--	-.43	(1.63)
CLOSS	3.01	(1.96)	-1.79	(1.64)	-.77	(.99)	-.36	(1.00)	.04	(.54)	4.34*	(1.59)	2.54	(2.34)
LBOY	-.05	(.43)	-.87	(.70)	-.11	(.30)	-.46	(.26)	-.34*	(.13)	.16	(.32)	.28	(.42)
LIMB	.17	(.58)	.95	(.82)	-.41	(.42)	.33	(.36)	.37*	(.18)	-.08	(.37)	.10	(.54)
PINC	-3.45	(2.21)	2.48	(3.00)	-2.19	(3.92)	-2.89	(2.33)	.47	(.26)	.36	(2.01)	-.26	(.45)
WEDUC	.25	(.26)	-.16	(.25)	.22	(.30)	-.04	(.14)	-.06	(.09)	.08	(.40)	-.05	(.49)
IFS	.41	(.88)	.79	(.41)	2.49*	(.78)	-.13	(.34)	.66*	(.30)	-.66	(.49)	.33	(.31)
ECO	4.01	(3.33)	3.41	(2.83)	4.88*	(2.04)	1.12	(1.73)	1.05	(.78)	1.65	(1.09)	-2.23	(2.97)
NAM	-1.42	(1.75)	1.30	(1.36)	.43	(1.03)	.33	(.62)	-.38	(.33)	.28	(.58)	-2.25	(1.35)
GPR	3.47*	(1.47)	-1.51	(1.43)	1.92	(1.04)	.59	(.57)	.83*	(.33)	1.31*	(.60)	.93	(1.38)
COM	3.98	(3.06)	3.75	(2.83)	4.22	(2.35)	.62	(1.35)	1.50*	(.60)	.41	(1.45)	2.40	(2.23)
SIB	2.58	(1.37)	2.40	(1.27)	1.95	(1.31)	-.56	(.82)	.43	(.44)	.70	(.55)	-.13	(1.10)
FIN	.75	(1.31)	-.66	(1.09)	1.19	(.81)	-.77	(.63)	.23	(.34)	-.50	(.54)	-.65	(.66)
FRE	.07	(1.03)	-1.08	(1.03)	.44	(.84)	.41	(.53)	.01	(.26)	-.14	(.57)	-1.87*	(.72)
WRK	.81	(1.38)	1.02	(1.01)	-.47	(.83)	1.00	(.56)	.06	(.26)	-.07	(.52)	1.33	(.72)
Constant	4.82	(16.14)	-11.58	(9.13)	-28.26*	(12.84)	13.70	(8.13)	-11.53*	(5.74)	8.29	(9.49)	2.21	(11.28)
R^2 (F)	.33	(1.26)	.40	(1.02)	.21	(1.92)	.31	(2.26)	.17	(2.81)	.25	(1.18)	.48	(1.77)

TABLE D1. *(continued)*

Predictor	Philippines B	Philippines (S.E.)	Turkey B	Turkey (S.E.)	Indonesia B	Indonesia (S.E.)	Korea B	Korea (S.E.)	Taiwan B	Taiwan (S.E.)	Singapore B	Singapore (S.E.)	United States B	United States (S.E.)
	Desire for Another Child: Wives with Four Living Children													
ROLD	.62	(1.27)	-.52	(.76)	.11	(1.03)	.13	(.72)	-1.03*	(.47)	.41	(.65)	-1.42	(1.49)
AGFB	-.03	(.09)	-.02	(.10)	-.03	(.12)	-.20*	(.06)	-.01	(.04)	-.02	(.07)	-.07	(.16)
MDUR	-.03	(.18)	-.05	(.10)	.01	(.13)	-.07	(.10)	.07	(.06)	-.15*	(.07)	-.07	(.18)
PREVM	-1.27	(1.78)	.95	(.98)	1.05	(.78)	--	--	-.16	(.69)	1.01	(2.08)	1.64	(1.00)
CLOSS	.10	(.70)	-.28	(.44)	-.38	(.59)	.37	(.29)	.19	(.27)	-.51	(1.12)	-1.66	(1.53)
LBOY	-.10	(.30)	-.23	(.23)	-.06	(.25)	-.53*	(.16)	-.43**	(.10)	-.68*	(.21)	.14	(.45)
LIMB	1.04*	(.35)	.58*	(.29)	.49	(.32)	.60*	(.19)	.43*	(.14)	.69*	(.31)	.02	(.58)
PINC	-1.46	(.84)	-.27	(1.12)	3.41	(2.76)	.31	(.89)	.15	(.16)	1.29	(1.56)	.19	(.35)
WEDUC	.14	(.12)	-.04	(.11)	.04	(.18)	.01	(.07)	-.04	(.05)	-.28	(.26)	-.13	(.25)
IFS	.68*	(.34)	.39	(.25)	1.96*	(.76)	.19	(.17)	.35	(.21)	.07	(.31)	.29	(.20)
ECO	3.39*	(1.54)	1.60*	(.67)	1.58	(1.22)	.06	(.54)	-.12	(.42)	-.35	(.68)	-1.78	(1.90)
NAM	.22	(.69)	.30	(.33)	.65	(.62)	-.11	(.22)	-.04	(.18)	-.15	(.38)	.93	(.71)
GPR	2.21*	(.76)	.67	(.35)	1.05	(.62)	.05	(.22)	.16	(.20)	-.27	(.39)	-.71	(.65)
COM	.29	(1.41)	1.04	(.62)	.20	(1.17)	-.49	(.47)	.06	(.37)	-1.20	(.86)	.03	(1.81)
SIB	-.05	(.69)	.57	(.38)	.84	(.61)	.43	(.22)	-.07	(.24)	-.19	(.39)	.27	(.82)
FIN	.95*	(.45)	-.25	(.28)	-.23	(.50)	-.37	(.25)	.03	(.23)	-.34	(.44)	-.39	(.48)
FRE	.47	(.52)	.40	(.27)	.15	(.51)	-.08	(.19)	.03	(.23)	-.01	(.38)	-.91	(.52)
WRK	-.44	(.58)	.28	(.32)	.42	(.52)	-.26	(.18)	.02	(.16)	-.09	(.32)	.70	(.51)
Constant	-7.07	(6.75)	-.71	(3.61)	-34.82*	(13.68)	.79	(4.45)	-4.20	(4.83)	-1.28	(6.06)	2.44	(6.27)
R^2 (F)	.14	(1.90)	.19	(2.35)	.15	(2.58)	.23	(3.32)	.14	(3.64)	.27	(1.64)	.23	(1.27)

Desire for Another Child: Husbands with Four Living Children

ROLD	4.64	(3.02)	-2.91	(1.46)	.03	(.82)	-.92	(1.86)	-.35	(.65)	-.61	(.82)	3.76	(4.70)
AGFB	.19	(.31)	-.03	(.12)	-.17	(.10)	-.12	(.19)	-.00	(.05)	-.08	(.10)	-.14	(.59)
MDUR	-.58	(.38)	.32	(.16)	.01	(.09)	-.02	(.23)	-.01	(.09)	.09	(.07)	-.52	(.52)
PREVM	1.71	(3.61)	-3.38	(2.42)	1.49	(.84)	-3.22	(1.75)	1.46	(.84)	9.32*	(2.17)	3.77	(4.51)
CLOSS	.06	(2.13)	-.31	(.89)	.90	(.71)	-.18	(1.01)	.44	(.39)	-.84	(2.25)	7.87	(7.60)
LBOY	-.05	(.84)	-.10	(.65)	-.73*	(.34)	-.63	(.55)	-.40*	(.15)	-.67*	(.30)	2.47	(2.29)
LIMB	2.25	(1.55)	.23	(.80)	.62	(.37)	.38	(.56)	.41*	(.20)	.48	(.45)	-4.01	(4.11)
PINC	.95	(2.00)	-2.15	(1.86)	.74	(2.85)	5.78*	(2.72)	-.07	(.17)	1.56	(1.81)	.30	(1.22)
WEDUC	-.32	(.33)	.20	(.19)	-.12	(.20)	-.46*	(.19)	-.10	(.07)	.20	(.28)	-.44	(.63)
IFS	1.07*	(.50)	.35	(.18)	1.35*	(.42)	.11	(.33)	.04	(.26)	.45	(.29)	.56	(.41)
ECO	-4.33	(4.30)	.83	(1.26)	.03	(1.45)	3.22	(2.66)	.09	(.74)	-1.45	(1.10)	5.71	(5.48)
NAM	-.77	(1.87)	1.06	(.73)	.56	(.73)	-.61	(1.13)	-.17	(.25)	-.24	(.46)	-.52	(1.79)
GPR	.66	(1.99)	-.63	(1.00)	1.04	(.65)	2.49*	(.98)	.06	(.30)	.07	(.53)	1.68	(2.80)
COM	-1.81	(4.29)	-.22	(1.22)	-.23	(1.26)	1.77	(2.85)	.44	(.58)	-.18	(1.14)	5.27	(6.13)
SIB	-1.62	(2.34)	.63	(.98)	.72	(.70)	.17	(1.31)	-.21	(.34)	-.89	(.58)	.80	(2.93)
FIN	-1.21	(1.68)	-.52	(.85)	.17	(.50)	-.37	(.86)	-.23	(.33)	.64	(.66)	-1.27	(1.78)
FRE	.31	(1.82)	.88	(.63)	-.71	(.59)	-.36	(.67)	-.28	(.24)	.43	(.80)	-.07	(1.88)
WRK	-2.39	(1.55)	-1.92*	(.75)	.86	(.58)	-.35	(.68)	-.11	(.23)	.52	(.72)	-1.31	(1.82)
Constant	-25.59	(15.72)	6.06	(5.99)	-17.21*	(7.90)	-3.70	(9.36)	1.40	(6.26)	-8.84	(8.34)	-9.44	(17.92)
R^2 (F)	.36	(.75)	.62	(2.22)	.21	(1.86)	.42	(1.63)	.15	(1.78)	.58	(2.68)	.73	(.89)

TABLE D1. *(continued)*

Predictor	Philippines		Turkey		Indonesia		Korea		Taiwan		Singapore		United States	
	B	(S.E.)	B	(S.E.)	B	(S.E.)	B	(S.E.)	B	(S.E.)	B	(S.E.)	B	(S.E.)
	Desire for Another Child: Wives with Five or More Living Children													
ROLD	-.34	(.46)	.19	(.72)	1.49*	(.47)	-.47	(.89)	-1.03*	(.48)	.23	(.67)	1.55	(2.14)
AGFB	-.04	(.05)	.01	(.09)	.06	(.07)	.03	(.09)	-.12*	(.04)	-.06	(.06)	.20	(.27)
MDUR	-.02	(.05)	-.00	(.08)	-.22**	(.06)	-.00	(.09)	.05	(.06)	-.04	(.05)	-.34	(.26)
PREVM	.57	(.91)	1.05	(.59)	.92*	(.45)	.32	(1.00)	-.34	(.57)	.23	(1.26)	.53	(1.15)
CLOSS	.01	(.30)	.11	(.32)	-.08	(.29)	-.62	(.38)	.42	(.23)	-.39	(.49)	.06	(2.42)
LBOY	.65*	(.18)	-.21	(.18)	.12	(.20)	-.65*	(.22)	-.44*	(.18)	-.14	(.26)	-.04	(.73)
LIMB	.66*	(.24)	.03	(.32)	.90*	(.27)	.83*	(.23)	.46	(.25)	-.14	(.38)	.46	(1.03)
PINC	-.77	(.43)	-1.03	(.77)	-.77	(1.31)	1.41	(1.23)	-.05	(.15)	2.82*	(1.28)	-.43	(.44)
WEDUC	.05	(.06)	.12	(.11)	.00	(.08)	-.11	(.09)	.07	(.06)	-.44*	(.18)	.01	(.33)
IFS	.39*	(.19)	.12	(.25)	.58*	(.25)	.12	(.22)	.29	(.23)	.36*	(.16)	.05	(.15)
ECO	-.40	(.66)	.77	(.47)	-.43	(.55)	.39	(.69)	-.11	(.40)	-.75	(.55)	-2.53	(2.42)
NAM	.11	(.28)	.40	(.29)	-.14	(.31)	.37	(.32)	.08	(.18)	.04	(.28)	-1.89	(1.07)
GPR	.25	(.28)	.62	(.35)	.56	(.30)	.28	(.31)	.11	(.20)	-.01	(.32)	.83	(.94)
COM	.09	(.59)	.51	(.52)	-.31	(.55)	-.48	(.81)	.18	(.36)	-.40	(.70)	.34	(2.24)
SIB	.52	(.30)	.43	(.32)	.14	(.32)	-.08	(.43)	.22	(.21)	-.00	(.33)	.28	(.93)
FIN	.19	(.24)	-.20	(.29)	.26	(.26)	-.09	(.33)	.49*	(.24)	-.85*	(.31)	.22	(.78)
FRE	-.21	(.23)	.30	(.25)	-.03	(.24)	-.41	(.25)	-.08	(.22)	.14	(.28)	-.04	(.94)
WRK	.19	(.29)	.07	(.35)	.30	(.29)	.04	(.25)	-.12	(.17)	-.19	(.22)	-.11	(.68)
Constant	-1.53	(3.65)	-.79	(3.43)	-10.50	(5.45)	-3.18	(6.82)	-.46	(5.00)	-8.42	(5.67)	-1.26	(10.57)
R^2 (F)	.11	(2.83)	.11	(1.25)	.12	(3.77)	.32	(2.81)	.14	(2.91)	.25	(1.63)	.28	(1.11)

Desire for Another Child: Husbands with Five or More Living Children

ROLD	-.31	(1.13)	--	--	-.50	(.51)	1.63	(1.31)	-1.07*	(.40)	-.43	(1.50)	-24.83	(18.35)
AGFB	-.01	(.13)	--	--	-.10	(.06)	.06	(.14)	-.04	(.05)	-.13	(.16)	-2.59	(2.10)
MDUR	-.13	(.12)	--	--	-.06	(.05)	-.08	(.15)	.08	(.05)	.04	(.09)	2.13	(1.87)
PREVM	.59	(1.57)	--	--	.27	(.43)	-.41	(1.30)	-.63	(.67)	-1.50	(2.10)	-14.84	(10.34)
CLOSS	1.01	(.70)	--	--	.10	(.35)	1.17*	(.51)	.05	(.28)	-1.87	(1.39)	--	--
LBOY	.16	(.43)	--	--	-.24	(.27)	-.53	(.30)	-.30	(.22)	2.74	(1.58)	4.43	(6.66)
LIMB	1.00	(.59)	--	--	1.12*	(.34)	.96*	(.39)	.58*	(.25)	1.95	(1.90)	3.35	(7.51)
PINC	-.25	(.91)	--	--	-1.12	(1.50)	1.33	(1.58)	-.06	(.14)	-.78	(3.45)	2.10	(1.46)
WEDUC	.07	(.13)	--	--	.07	(.10)	-.12	(.12)	.06	(.07)	-.45	(.61)	-.07	(.78)
IFS	-.07	(.17)	--	--	.20	(.26)	-.10	(.15)	-.11	(.18)	.12	(.18)	.91	(.61)
ECO	-.42	(1.57)	--	--	-.40	(.82)	-.61	(.87)	.95	(.50)	2.06	(1.46)	9.14	(12.72)
NAM	-.23	(.73)	--	--	.14	(.41)	-.56	(.50)	.00	(.20)	.22	(.98)	6.95	(8.51)
GPR	-.41	(.77)	--	--	.37	(.39)	-.06	(.47)	.12	(.23)	1.00	(.80)	8.86	(5.90)
COM	-.74	(1.52)	--	--	.65	(.76)	1.30	(.77)	.65	(.42)	2.62	(1.66)	11.60	(10.44)
SIB	.12	(.86)	--	--	.69	(.40)	-.47	(.40)	.12	(.32)	.64	(1.00)	2,60	(1.97)
FIN	.69	(.70)	--	--	-.54	(.32)	-.00	(.63)	.65*	(.26)	-.51	(.81)	-1.98	(2.06)
FRE	-.14	(.78)	--	--	.09	(.33)	.47	(.41)	.15	(.24)	.07	(.65)	1.10	(2.09)
WRK	-.37	(.80)	--	--	-.71*	(.31)	.27	(.42)	.33	(.19)	1.57	(.88)	-.78	(1.83)
Constant	4.76	(6.25)	--	--	3.85	(5.42)	-6.77	(4.17)	5.69	(3.77)	4.57	(8.96)	71.80	(59.56)
R^2 (F)	.14	(.68)	--	--	.15	(2.37)	.62	(2.48)	.27	(2.76)	.65	(1.47)	.90	(1.60)

TABLE D1. *(continued)*

	Philippines		Turkey		Indonesia		Korea		Taiwan		Singapore		United States	
Predictor	B	(S.E.)	B	(S.E.)	B	(S.E.)	B	(S.E.)	B	(S.E.)	B	(S.E.)	B	(S.E.)
	Ideal Family Size: Wives with No Living Children													
MDUR	.06	(.09)	-.06	(.07)	-.12	(.10)	.18*	(.09)	--	--	-.01	(.16)	-.12	(.12)
PINC	.45	(1.60)	.75	(2.37)	1.47	(6.21)	.61	(2.66)	--	--	-5.75	(3.17)	-.26	(.26)
WEDUC	-.06	(.20)	-.11	(.19)	-.01	(.37)	-.19	(.20)	--	--	.18	(.60)	.29	(.18)
URBAN	-.38	(1.01)	-1.06	(1.01)	-2.80	(1.55)	-.39	(.54)	--	--	.76	(1.39)	1.34	(.96)
MEDIA	.10	(.23)	.06	(.17)	.20	(.30)	.15	(.16)	--	--	.05	(.43)	-.22	(.19)
DAC	1.56**	(.35)	.10	(.70)	1.18	(.72)	1.03	(.60)	--	--	-.16	(.30)	.68	(.46)
ECOV	1.53	(1.96)	1.83	(1.54)	2.93	(3.63)	-.18	(.72)	--	--	1.82	(1.52)	1.71	(.87)
NAMV	.14	(1.02)	.38	(.59)	.82	(2.24)	.06	(.46)	--	--	.88	(.73)	.33	(.55)
GPRV	.29	(1.60)	.87	(1.14)	.86	(1.60)	.28	(.73)	--	--	.78	(1.21)	.27	(.85)
COMV	2.47*	(1.13)	.82	(.94)	.34	(1.87)	-1.04	(.67)	--	--	2.26	(1.19)	.05	(1.07)
FIND	-.89	(.62)	.14	(.48)	.59	(.83)	-.26	(.33)	--	--	-.47	(.51)	.22	(.31)
FRED	-1.06	(.76)	-.58	(.52)	-.01	(.89)	-.02	(.29)	--	--	-.64	(.52)	-.30	(.33)
WRKD	-1.47	(1.15)	-.87	(.66)	2.08	(2.05)	.36	(.69)	--	--	-.87	(.87)	-.67	(.48)
Constant	-8.92	(13.63)	2.13	(10.25)	-21.83	(21.39)	7.86	(8.64)	--	--	13.59	(10.76)	8.64	(5.73)
R^2 (F)	.52	(3.88)	.08	(.79)	.53	(3.53)	.33	(2.28)	--	--	.30	(1.20)	.24	(4.84)

Ideal Family Size: Husbands with No Living Children

MDUR	--	--	-.28	(.27)	--	--	--	--	--	--	.23*	(.10)	-.01	(.15)
PINC	--	--	-1.52	(2.19)	--	--	--	--	--	--	-1.09	(3.21)	-.08	(.27)
WEDUC	--	--	-.11	(.32)	--	--	--	--	--	--	-.36	(.69)	.03	(.24)
URBAN	--	--	-2.72	(3.63)	--	--	--	--	--	--	2.12	(1.93)	-.43	(.72)
MEDIA	--	--	.80	(.46)	--	--	--	--	--	--	-.42	(.47)	.2[illegible]	(.25)
DAC	--	--	1.10	(.72)	--	--	--	--	--	--	.56	(.34)	1.17*	(.42)
ECOV	--	--	-.62	(3.28)	--	--	--	--	--	--	-.80	(.94)	-.25	(.86)
NAMV	--	--	-.67	(1.62)	--	--	--	--	--	--	1.00	(.68)	.64	(.59)
GPRV	--	--	.36	(2.90)	--	--	--	--	--	--	-1.80	(1.95)	-.40	(.90)
COMV	--	--	-.43	(2.15)	--	--	--	--	--	--	-.79	(1.21)	.40	(.80)
FIND	--	--	2.08	(1.54)	--	--	--	--	--	--	.19	(.92)	-.52	(.31)
FRED	--	--	.35	(1.19)	--	--	--	--	--	--	.05	(.60)	-.13	(.35)
WRKD	--	--	-1.13	(1.74)	--	--	--	--	--	--	-1.36	(.89)	.69	(.55)
Constant	--	--	1.41	(26.32)	--	--	--	--	--	--	28.13*	(9.47)	3.37	(6.82)
R^2 (F)	--	--	.39	(1.01)	--	--	--	--	--	--	.76	(2.18)	.62	(6.03)

TABLE D1. *(continued)*

Predictor	Philippines B	Philippines (S.E.)	Turkey B	Turkey (S.E.)	Indonesia B	Indonesia (S.E.)	Korea B	Korea (S.E.)	Taiwan B	Taiwan (S.E.)	Singapore B	Singapore (S.E.)	United States B	United States (S.E.)
	Ideal Family Size: Wives with One Living Child													
AGFB	.03	(.05)	.06	(.05)	-.06	(.07)	.01	(.04)	-.06	(.05)	-.00	(.06)	.08	(.07)
MDUR	.02	(.06)	-.01	(.06)	.01	(.05)	.03	(.07)	.11	(.07)	-.06	(.09)	-.07	(.12)
PREVM	-1.94	(2.17)	.43	(1.19)	.01	(.62)	1.81	(1.50)	-.16	(1.70)	6.50*	(2.97)	-.23	(.72)
CLOSS	.79	(.71)	1.55*	(.55)	.50	(.48)	.83	(.54)	.44	(.76)	-2.97*	(1.31)	.06	(1.14)
PINC	.33	(.81)	.13	(1.43)	1.62	(2.45)	1.38	(1.41)	.10	(.25)	-.17	(1.87)	-.03	(.23)
WEDUC	-.29*	(.10)	-.20	(.11)	-.09	(.14)	-.15	(.08)	-.03	(.06)	.22	(.28)	-.11	(.17)
URBAN	-.65	(.57)	-.83	(.62)	-.72	(.60)	.31	(.27)	-.91*	(.32)	-.07	(.55)	.19	(.49)
MEDIA	-.11	(.13)	-.06	(.09)	.09	(.11)	-.08	.08	-.07	(.07)	-.21	(.12)	-.13	(.16)
DAC	.40*	(.12)	.30	(.17)	1.05*	(.34)	.24	(.14)	.48*	(.20)	.44*	(.20)	.09	(.23)
ECOV	.39	(.86)	-.55	(.62)	-.09	(.80)	.61	(.45)	.89	(.47)	.29	(.62)	.77	(.68)
NAMV	.59	(.63)	-.45	(.33)	.11	(.52)	.43*	(.21)	.58*	(.22)	-.08	(.33)	.06	(.48)
GPRV	-.29	(.80)	-.49	(.54)	-1.18	(.67)	.62	(.35)	.15	(.47)	.13	(.74)	-.01	(.56)
COMV	.28	(.65)	-.42	(.40)	-.49	(.55)	.18	(.34)	-.38	(.37)	-.06	(.57)	.47	(.52)
FIND	-.33	(.27)	-.62*	(.21)	.15	(.24)	-.24	(.13)	-.33*	(.16)	-.27	(.27)	-.31	(.19)
FRED	.52	(.40)	-.09	(.26)	-.14	(.30)	.21	(.14)	-.02	(.21)	-.32	(.24)	-1.07*	(.32)
WRKD	.17	(.56)	.76*	(.32)	-.29	(.44)	-.04	(.25)	.05	(.29)	.10	(.42)	-.44	(.33)
Constant	7.19	(5.99)	12.51*	(5.21)	7.96	(7.00)	7.79*	(3.39)	12.70**	(3.16)	15.24*	(5.04)	19.00**	(4.22)
R^2 (F)	.24	(2.77)	.20	(3.22)	.12	(1.71)	.23	(3.58)	.33	(5.29)	.25	(2.45)	.14	(2.65)

Ideal Family Size: Husbands with One Living Child

AGFB	.01	(.12)	.08	(.10)	.09	(.10)	--	--	.08	(.09)	--	--	.01	(.11)
MDUR	.02	(.07)	.01	(.09)	.01	(.05)	--	--	-.02	(.13)	--	--	-.17	(.12)
PREVM	-4.53	(3.43)	.51	(2.15)	-.50	(1.06)	--	--	-1.95	(4.74)	--	--	-.66	(1.64)
CLOSS	.63	(2.19)	1.62	(1.46)	-.62	(.68)	--	--	-.88	(1.19)	--	--	-1.32	(2.04)
PINC	.72	(1.89)	.33	(1.31)	4.93	(3.80)	--	--	-.67	(.42)	--	--	.13	(.35)
WEDUC	.02	(.26)	-.20	(.23)	-.08	(.22)	--	--	.10	(.13)	--	--	-.20	(.29)
URBAN	-2.61	(1.74)	-1.50	(1.47)	-.19	(.96)	--	--	-.16	(.69)	--	--	-.30	(1.12)
MEDIA	-.40	(.32)	-.04	(.32)	-.10	(.15)	--	--	.03	(.10)	--	--	.03	(.33)
DAC	.33	(.24)	.46*	(.18)	.24	(.34)	--	--	.29	(.22)	--	--	.20	(.19)
ECOV	-.99	(2.76)	.75	(1.58)	.72	(1.57)	--	--	1.02	(.72)	--	--	-.53	(1.23)
NAMV	-1.32	(1.98)	-.05	(.63)	-.35	(.86)	--	--	.05	(.35)	--	--	.86	(.79)
GPRV	-2.28	(1.96)	1.19	(1.36)	-1.28	(1.27)	--	--	-.08	(.60)	--	--	-.93	(1.08)
COMV	-.72	(1.43)	.94	(1.05)	.03	(.78)	--	--	-.78	(.59)	--	--	.55	(.92)
FIND	.01	(.82)	.11	(.44)	-.32	(.34)	--	--	-.01	(.25)	--	--	-.08	(.35)
FRED	-.66	(.80)	-.20	(.62)	.69	(.52)	--	--	.12	(.26)	--	--	-.58	(.41)
WRKD	-.65	(1.21)	.75	(.98)	.02	(.80)	--	--	-.15	(.47)	--	--	-1.01	(.76)
Constant	28.83	(16.08)	-4.73	(11.54)	4.63	(12.16)	--	--	16.25*	(4.56)	--	--	22.37*	(9.06)
R^2 (F)	.32	(.82)	.55	(2.10)	.18	(1.20)	--	--	.35	(2.20)	--	--	.20	(.85)

TABLE D1 *(continued)*

	Philippines		Turkey		Indonesia		Korea		Taiwan		Singapore		United States	
Predictor	B	(S.E.)	B	(S.E.)	B	(S.E.)	B	(S.E.)	B	(S.E.)	B	(S.E.)	B	(S.E.)
	Ideal Family Size: Wives with Two Living Children													
AGFB	.01	(.04)	-.03	(.04)	-.02	(.04)	.09	(.05)	.04	(.03)	-.01	(.04)	.03	(.05)
MDUR	-.02	(.04)	.09*	(.03)	-.00	(.03)	.06	(.04)	.05	(.04)	.03	(.04)	.03	(.07)
PREVM	-5.12*	(1.34)	-.97	(.74)	.27	(.40)	--	--	-2.75*	(1.28)	--	--	-.72	(.69)
CLOSS	.74	(.48)	.14	(.37)	.25	(.29)	.20	(.57)	.08	(.38)	2.05	(1.08)	1.77*	(.78)
PINC	.75	(.59)	-2.28	(1.38)	-.61	(1.41)	-.32	(1.11)	.00	(.15)	-1.11	(.93)	.12	(.16)
WEDUC	-.10	(.08)	.02	(.08)	-.03	(.08)	-.06	(.07)	-.04	(.05)	.30	(.17)	-.07	(.12)
URBAN	-.63	(.40)	.73	(.44)	-.24	(.38)	.17	(.29)	-.46	(.25)	-.58	(.35)	-.10	(.35)
MEDIA	.02	(.09)	-.01	(.08)	-.02	(.07)	.01	(.07)	-.04	(.04)	-.06	(.08)	.16	(.12)
DAC	.29*	(.11)	.35	(.19)	.53**	(.09)	.35*	(.11)	.20*	(.08)	.26*	(.08)	.39*	(.18)
ECOV	.42	(.65)	-.92	(.52)	.10	(.50)	-.11	(.48)	.56	(.36)	.38	(.41)	-.81	(.52)
NAMV	.47	(.39)	-.17	(.28)	-.50	(.36)	.01	(.23)	.05	(.15)	-.20	(.21)	.57	(.33)
GPRV	-.27	(.59)	.13	(.57)	-.92*	(.47)	-.25	(.34)	.28	(.34)	.38	(.37)	-.70	(.52)
COMV	.06	(.43)	-.12	(.36)	-.37	(.36)	.89*	(.30)	.12	(.24)	-.19	(.22)	.33	(.37)
FIND	-.26	(.20)	.04	(.18)	-.06	(.16)	.05	(.14)	-.11	(.10)	-.00	(.15)	-.19	(.15)
FRED	.11	(.27)	-.10	(.22)	-.23	(.20)	.09	(.15)	-.15	(.13)	-.37*	(.18)	-.33	(.21)
WRKD	.44	(.34)	.20	(.24)	.14	(.29)	-.21	(.24)	.07	(.16)	.02	(.26)	-.53*	(.27)
Constant	7.14	(4.59)	14.72**	(3.75)	17.10**	(4.19)	12.68*	(3.10)	13.52**	(2.12)	17.86**	(3.13)	17.67**	(2.96)
R^2 (F)	.15	(3.04)	.16	(3.70)	.17	(3.97)	.14	(3.68)	.19	(5.06)	.29	(4.49)	.11	(2.93)

Ideal Family Size: Husbands with Two Living Children

AGFB	.01	(.09)	-.03	(.08)	.08	(.08)	.02	(.10)	.01	(.04)	-.08	(.09)	.06	(.07)
MDUR	.12	(.10)	.08	(.07)	.03	(.06)	.03	(.08)	.04	(.04)	-.07	(.05)	.08	(.05)
PREVM	--	--	.94	(1.18)	-.76	(.64)	--	--	-.94	(1.77)	--	--	1.35	(.83)
CLOSS	1.18	(1.02)	.18	(.90)	.12	(.51)	-.41	(1.11)	-.91	(.60)	.80	(1.90)	-.48	(1.35)
PINC	.57	(1.11)	-.34	(1.53)	2.75	(2.14)	-.70	(1.72)	.27	(.22)	.48	(1.53)	-.17	(.24)
WEDUC	.02	(.12)	.05	(.18)	-.07	(.12)	-.00	(.10)	-.13*	(.07)	-.04	(.32)	-.08	(.15)
URBAN	-.96	(.91)	-.36	(.90)	-.21	(.66)	.61	(.59)	-.54	(.36)	.06	(.57)	.23	(.55)
MEDIA	-.01	(.17)	-.41	(.21)	-.27*	(.13)	-.05	(.18)	-.14*	(.06)	.12	(.19)	.09	(.19)
DAC	.48*	(.11)	.18	(.17)	.71*	(.25)	.20	(.14)	.20*	(.08)	.26	(.16)	.13	(.14)
ECOV	-.82	(1.28)	.24	(1.14)	-.59	(.90)	.91	(.86)	.76	(.50)	1.60	(.84)	-.55	(.71)
NAMV	-1.84*	(.83)	.97	(.63)	.62	(.64)	.03	(.36)	-.20	(.20)	-.17	(.30)	1.03	(.54)
GPRV	-.24	(.81)	-1.08	(.95)	-1.66	(1.02)	-.24	(.66)	-.10	(.44)	-.57	(.78)	1.01	(.74)
COMV	-.96	(.86)	.29	(.75)	-.27	(.61)	.35	(.54)	-.05	(.33)	.23	(.53)	.69	(.56)
FIND	-.32	(.41)	-.28	(.45)	-.21	(.27)	.07	(.25)	.05	(.16)	-.26	(.25)	.03	(.24)
FRED	.19	(.45)	.57	(.50)	.03	(.37)	.21	(.30)	-.17	(.15)	-.33	(.33)	-.06	(.28)
WRKD	.47	(.77)	.10	(.70)	.11	(.50)	1.29	(.74)	.01	(.24)	.48	(.60)	-.12	(.49)
Constant	15.60	(8.56)	13.38	(8.06)	11.19	(6.20)	11.14	(5.62)	16.34**	(2.89)	16.13*	(5.46)	9.92	(5.03)
R^2 (F)	.44	(2.30)	.30	(1.21)	.19	(1.96)	.10	(.52)	.31	(4.13)	.32	(2.60)	.22	(1.77)

TABLE D1. *(continued)*

	Philippines		Turkey		Indonesia		Korea		Taiwan		Singapore		United States	
Predictor	B	(S.E.)	B	(S.E.)	B	(S.E.)	B	(S.E.)	B	(S.E.)	B	(S.E.)	B	(S.E.)
	Ideal Family Size: Wives with Three Living Children													
AGFB	.10*	(.04)	.06	(.05)	-.02	(.04)	.01	(.04)	.04	(.02)	.03	(.04)	.06	(.09)
MDUR	-.06	(.05)	.06	(.05)	.05	(.03)	-.00	(.04)	.00	(.02)	.03	(.05)	-.03	(.09)
PREVM	1.44	(1.40)	-.26	(1.14)	-.53	(.35)	-2.05	(1.12)	-.89	(.84)	--	--	-1.07	(.79)
CLOSS	.84*	(.41)	.18	(.40)	.05	(.29)	.10	(.40)	.26	(.23)	-.62	(.82)	-.22	(1.03)
PINC	-.38	(.49)	-1.22	(1.10)	-.30	(2.01)	-1.29	(1.12)	.01	(.12)	1.55	(1.28)	-.08	(.28)
WEDUC	-.06	(.07)	.08	(.09)	.01	(.10)	-.01	(.07)	-.03	(.04)	-.13	(.22)	.18	(.22)
URBAN	-.30	(.40)	1.34*	(.51)	-.28	(.36)	-.18	(.27)	-.31	(.18)	-.16	(.43)	-.41	(.62)
MEDIA	.07	(.09)	-.24*	(.09)	-.06	(.07)	-.09	(.07)	-.08*	(.03)	-.00	(.09)	.17	(.22)
DAC	.14	(.15)	.42	(.23)	.41*	(.16)	-.04	(.11)	.07	(.06)	.26	(.23)	.47	(.25)
ECOV	-.14	(.53)	-.46	(.66)	-.13	(.50)	.21	(.48)	.48	(.29)	.91	(.51)	-1.95*	(.84)
NAMV	-.20	(.48)	-.26	(.39)	-.64*	(.32)	.05	(.22)	.29*	(.12)	.31	(.23)	.76	(.63)
GPRV	-.92	(.58)	-.41	(.48)	-.83	(.73)	.59	(.33)	.18	(.21)	-.44	(.47)	-.61	(.78)
COMV	-.19	(.37)	-.29	(.40)	-.37	(.34)	.54	(.31)	-.44	(.18)	-.21	(.38)	.52	(.66)
FIND	-.23	(.22)	-.19	(.20)	-.14	(.15)	-.33*	(.14)	-.02	(.08)	.13	(.20)	-.18	(.25)
FRED	-.15	(.24)	-.09	(.25)	.02	(.23)	-.23	(.15)	.09	(.10)	-.17	(.21)	-.12	(.36)
WRKD	.13	(.31)	-.04	(.30)	-.15	(.31)	.31	(.24)	-.23	(.13)	-.35	(.31)	.39	(.47)
Constant	17.67**	(3.82)	15.42*	(4.64)	19.85*	(5.73)	16.69**	(3.08)	17.29**	(1.82)	16.57**	(3.62)	16.55*	(5.32)
R^2 (F)	.09	(1.61)	.08	(1.34)	.14	(3.09)	.09	(1.98)	.15	(6.05)	.16	(2.04)	.18	(2.57)

Ideal Family Size: Husbands with Three Living Children

AGFB	-.17	(.11)	.08	(.16)	.07	(.05)	.09	(.09)	.03	(.04)	.02	(.08)	-.03	(.13)
MDUR	.04	(.07)	-.03	(.08)	.04	(.04)	.18*	(.07)	.02	(.03)	.09	(.06)	-.06	(.08)
PREVM	--	--	1.49	(4.94)	-.68	(.43)	-3.28	(2.27)	-.06	(.74)	--	--	-1.34	(1.21)
CLOSS	1.08	(1.09)	-.09	(1.35)	.38	(.38)	-1.15	(.86)	.20	(.44)	2.89	(1.84)	1.21	(1.77)
FINC	-1.09	(1.29)	-.96	(2.64)	.10	(1.73)	.55	(2.02)	-.08	(.21)	-.46	(2.01)	.31	(.38)
WEDUC	.02	(.15)	.06	(.21)	-.02	(.10)	.01	(.12)	.10	(.07)	.02	(.42)	-.81*	(.31)
URBAN	.13	(.81)	-1.41	(1.48)	-.04	(.47)	-.26	(.57)	-.69*	(.31)	-.65	(.83)	1.35	(1.04)
MEDIA	-.13	(.17)	.01	(.33)	-.02	(.09)	-.16	(.18)	-.08	(.06)	-.04	(.18)	-.56	(.35)
DAC	-.12	(.23)	.22	(.21)	.34*	(.15)	.25	(.26)	.10	(.16)	-.46	(.37)	.08	(.23)
ECOV	1.43	(1.37)	.74	(1.41)	-.36	(.99)	.56	(.90)	.76	(.51)	.38	(.99)	.57	(1.28)
NAMV	-.26	(1.02)	.75	(.94)	-.40	(.61)	.75	(.46)	.28	(.21)	-.35	(.44)	1.62	(.92)
GPRV	1.52	(1.41)	.05	(1.65)	-.45	(.85)	-1.29	(.69)	.30	(.41)	.95	(.70)	2.13	(1.78)
COMV	-.01	(.86)	-.24	(1.07)	.16	(.48)	-.02	(.57)	-.20	(.35)	-.64	(.81)	2.48	(1.28)
FIND	.48	(.43)	-.19	(.73)	.14	(.22)	.60	(.36)	-.01	(.15)	-.07	(.38)	-.65	(.35)
FRED	-.23	(.48)	-1.32	(.77)	-.07	(.28)	-.08	(.34)	-.10	(.17)	-.17	(.49)	-.50	(.64)
WRKD	.93	(.59)	-.13	(.93)	.55	(.33)	-.03	(.67)	-.17	(.26)	-.48	(.59)	.19	(.74)
Constant	7.40	(8.21)	13.55	(11.79)	12.00	(6.85)	14.78*	(5.63)	15.86**	(3.26)	18.94*	(6.61)	12.01	(11.30)
R^2 (F)	(.26)	(1.06)	.25	(.62)	.22	(2.23)	.17	(1.17)	.10	(1.60)	.15	(.71)	.48	(2.05)

TABLE D1. *(continued)*

	Philippines		Turkey		Indonesia		Korea		Taiwan		Singapore		United States	
Predictor	B	(S.E.)	B	(S.E.)	B	(S.E.)	B	(S.E.)	B	(S.E.)	B	(S.E.)	B	(S.E.)
	Ideal Family Size: Wives with Four Living Children													
AGFB	.06	(.07)	.09	(.08)	-.02	(.04)	.05	(.08)	.03	(.03)	.01	(.05)	-.19	(.19)
MDUR	-.01	(.06)	-.02	(.06)	.03	(.03)	.09	(.05)	-.03	(.03)	.13*	(.05)	.24	(.15)
PREVM	1.07	(1.40)	-1.00	(1.20)	-.33	(.30)	--	--	.23	(.67)	.57	(2.20)	-2.73	(1.43)
CLOSS	.24	(.55)	.83	(.49)	.07	(.25)	.27	(.43)	-.13	(.27)	1.66	(1.09)	.32	(2.52)
PINC	.73	(.76)	1.17	(1.49)	.78	(1.51)	-.89	(1.32)	-.20	(.15)	-.03	(1.63)	-.35	(.53)
WEDUC	-.09	(.10)	-.10	(.13)	-.05	(.07)	-.07	(.09)	.06	(.05)	.32	(.29)	.61	(.38)
URBAN	-.68	(.56)	.40	(.64)	.04	(.34)	-.12	(.38)	-.16	(.25)	-1.12*	(.55)	.82	(1.27)
MEDIA	.00	(.12)	-.09	(.11)	-.12*	(.06)	.18	(.10)	-.11*	(.05)	.09	(.12)	.27	(.39)
DAC	.24	(.18)	-.06	(.25)	.17	(.13)	-.00	(.27)	.07	(.18)	.33	(.24)	.33	(.45)
ECOV	.33	(.86)	.45	(.90)	-.13	(.42)	2.75**	(.69)	1.24*	(.48)	.63	(.69)	.14	(1.71)
NAMV	.27	(.63)	.12	(.51)	-.06	(.27)	.49	(.28)	.22	(.15)	.02	(.29)	.38	(1.27)
GPRV	-1.25	(.81)	.25	(.75)	.23	(.53)	1.11*	(.45)	.00	(.30)	.23	(.62)	1.18	(1.62)
COMV	-.16	(.52)	-1.25*	(.55)	-.20	(.27)	.41	(.40)	-.03	(.26)	.36	(.59)	-.67	(1.07)
FIND	-.23	(.27)	-.33	(.25)	-.20	(.14)	-.18	(.21)	-.00	(.10)	-.04	(.26)	.28	(.50)
FRED	-.75*	(.32)	-.13	(.32)	-.15	(.19)	.07	(.20)	-.04	(.14)	.01	(.27)	-1.03	(.74)
WRKD	.43	(.50)	-.75	(.46)	-.10	(.25)	-.03	(.33)	.05	(.19)	.03	(.40)	-.92	(.94)
Constant	16.17*	(5.61)	12.98*	(5.96)	15.69*	(4.60)	4.54	(4.52)	17.13**	(2.67)	14.32*	(5.73)	14.84	(13.06)
R^2 (F)	.07	(.96)	.10	(1.21)	.10	(1.82)	.15	(2.31)	.13	(3.68)	.16	(1.01)	.15	(.82)

Ideal Family Size: Husbands with Four Living Children

AGFB	-.28	(.17)	.08	(.16)	.10	(.06)	.09	(.15)	-.03	(.06)	.01	(.08)	.53	(.29)
MDUR	-.04	(.15)	-.03	(.09)	-.02	(.04)	.07	(.12)	-.02	(.04)	.03	(.06)	-.11	(.28)
PREVM	-.22	(2.04)	.49	(2.97)	-1.11*	(.47)	.24	(2.20)	1.63	(1.20)	-1.06	(3.25)	3.07	(3.81)
CLOSS	.36	(1.41)	1.60	(1.17)	-.45	(.39)	1.76	(.92)	.15	(.57)	.70	(2.31)	5.40	(5.02)
PINC	.93	(1.36)	4.26	(2.28)	.32	(2.15)	1.87	(4.09)	-.10	(.31)	-2.06	(3.02)	.67	(.81)
WEDUC	.18	(.19)	-.19	(.25)	-.04	(.12)	.01	(.29)	-.07	(.10)	.42	(.39)	-.32	(.52)
URBAN	1.34	(1.12)	1.27	(1.59)	-.30	(.63)	-1.28	(1.00)	-.05	(.47)	-.47	(1.10)	-5.49	(2.51)
MEDIA	-.60	(.30)	.24	(.42)	-.13	(.12)	-.11	(.28)	-.09	(.08)	-.20	(.21)	.02	(.65)
DAC	-.07	(.29)	.87*	(.41)	.27	(.17)	-.02	(.36)	-.36	(.32)	.27	(.23)	.61*	(.21)
ECOV	2.60	(2.48)	.58	(2.53)	.14	(.73)	1.74	(1.81)	1.90*	(.84)	1.38	(1.31)	-3.15	(2.31)
NAMV	-.82	(1.38)	-1.43	(1.51)	-.23	(.46)	.73	(.68)	.12	(.30)	-.08	(.44)	-.94	(1.42)
GPRV	-.23	(1.11)	.00	(1.52)	.15	(.65)	1.26	(1.75)	.72	(.50)	-.31	(.71)	2.35	(2.63)
COMV	.83	(1.15)	.76	(1.20)	.51	(.47)	.55	(.95)	.46	(.49)	-.80	(.91)	3.72	(3.17)
FIND	1.29*	(.57)	-1.11	(.56)	.07	(.22)	.55	(.60)	-.32	(.20)	-.51	(.45)	2.09*	(.77)
FRED	-1.24	(.80)	-.14	(.75)	.40	(.33)	.52	(.57)	.04	(.27)	.40	(.54)	-1.62	(1.17)
WRKD	.34	(1.02)	.09	(1.07)	-.80	(.41)	.34	(.86)	.59	(.32)	-1.03	(.98)	2.74	(2.20)
Constant	11.47	(11.49)	1.32	(11.53)	13.05*	(5.99)	-3.74	(12.32)	12.08*	(4.29)	27.44*	(8.93)	-17.23	(25.36)
R^2 (F)	.34	(.84)	.55	(2.07)	.20	(1.97)	.25	(.88)	.11	(1.40)	.16	(.45)	.81	(2.15)

TABLE D1. *(continued)*

Predictor	Philippines B	Philippines (S.E.)	Turkey B	Turkey (S.E.)	Indonesia B	Indonesia (S.E.)	Korea B	Korea (S.E.)	Taiwan B	Taiwan (S.E.)	Singapore B	Singapore (S.E.)	United States B	United States (S.E.)
	Ideal Family Size: Wives with Five or More Living Children													
AGFB	.09	(.05)	.09	(.07)	-.05	(.05)	.00	(.10)	.07	(.05)	.07	(.08)	.16	(.30)
MDUR	.08	(.04)	.06	(.06)	.07*	(.03)	.06	(.07)	.02	(.03)	.03	(.05)	-.16	(.26)
PREVM	1.25	(1.12)	-.99	(1.07)	-.98*	(.33)	-.82	(1.45)	-.20	(.68)	-.34	(1.64)	-2.41	(1.76)
CLOSS	.44	(.38)	-.46	(.48)	.32	(.24)	.54	(.60)	.41	(.30)	.15	(.80)	-.79	(3.61)
PINC	.08	(.56)	1.54	(1.32)	1.01	(1.22)	-1.86	(2.02)	-.24	(.20)	-1.53	(2.32)	-.23	(.78)
WEDUC	-.04	(.08)	-.30	(.17)	.00	(.07)	.08	(.15)	-.02	(.07)	-.11	(.36)	.02	(.56)
URBAN	-1.55*	(.49)	.76	(.63)	-.28	(.32)	-.16	(.53)	-.26	(.33)	-.07	(.56)	-.59	(1.90)
MEDIA	-.11	(.09)	-.13	(.11)	-.11	(.06)	-.10	(.13)	-.17*	(.06)	-.18	(.15)	.09	(.65)
DAC	.03	(.23)	.61	(.47)	-.06	(.17)	.09	(.28)	-.14	(.21)	.23	(.46)	-.07	(.50)
ECOV	-.36	(.61)	-.00	(.78)	.16	(.41)	.19	(1.13)	.15	(.62)	.15	(.79)	-.47	(2.95)
NAMV	-.70	(.45)	.11	(.48)	-.77*	(.29)	.76	(.51)	-.01	(.18)	.51	(.36)	-1.05	(1.95)
GPRV	.14	(.47)	.61	(.80)	.29	(.41)	.18	(.66)	-.04	(.35)	-1.23	(.65)	.27	(2.44)
COMV	.06	(.44)	.05	(.54)	-.09	(.30)	1.14	(.66)	-.27	(.31)	.05	(.64)	3.74	(2.07)
FIND	-.45*	(.21)	-.01	(.31)	-.41*	(.14)	-.05	(.28)	-.14	(.14)	-.21	(.37)	-1.93*	(.86)
FRED	-.19	(.27)	-.12	(.32)	-.27	(.21)	.01	(.31)	.11	(.18)	-1.17*	(.33)	-3.39*	(1.03)
WRKD	.23	(.36)	-.97*	(.48)	-.50*	(.25)	.42	(.49)	.41	(.25)	.05	(.40)	.46	(1.55)
Constant	15.55*	(4.22)	7.70	(6.03)	18.26**	(3.45)	14.37*	(6.56)	19.75**	(3.26)	29.58**	(6.07)	24.11	(18.55)
R^2 (F)	.08	(2.32)	.10	(1.20)	.09	(3.03)	.09	(.72)	.14	(3.24)	.32	(2.61)	.35	(1.73)

Ideal Family Size: Husbands with Five or More Living Children

AGFB	.02	(.15)	.02	(.11)	-.01	(.06)	.74*	(.28)	.07	(.07)	.18	(.20)	1.70	(.97)
MDUR	.09	(.17)	.09	(.06)	.03	(.04)	.56*	(.16)	.00	(.04)	.06	(.10)	1.04	(.71)
PREVM	.80	(2.22)	-1.68	(1.28)	.28	(.44)	5.65*	(2.76)	.61	(.99)	2.85	(2.50)	3.82	(6.48)
CLOSS	-.06	(1.23)	.67	(.73)	.36	(.37)	-1.51	(1.44)	-.54	(.43)	2.87	(1.77)	--	
PINC	.16	(1.64)	.57	(1.48)	-2.95	(1.77)	-1.52	(3.89)	-.07	(.29)	4.91	(4.44)	-1.83	(2.09)
WEDUC	-.13	(.22)	-.62*	(.22)	.16	(.10)	.26	(.30)	-.03	(.11)	.19	(.77)	.53	(1.43)
URBAN	-2.00	(1.56)	-1.87*	(.79)	-.57	(.54)	1.26	(1.28)	.03	(.50)	-.50	(1.57)	-.59	(8.55)
MEDIA	-.18	(.28)	.28	(.23)	.20*	(.10)	.18	(.40)	-.15	(.08)	-.17	(.36)	1.22	(1.89)
DAC	.42	(.70)	--	--	-.12	(.21)	.27	(.49)	-.55*	(.26)	.45	(.41)	.42	(.62)
ECOV	1.92	(1.71)	.14	(1.35)	1.60*	(.62)	1.45	(1.97)	.90	(.83)	-1.36	(1.73)	-14.62	(10.69)
NAMV	.30	(1.06)	.44	(.57)	.14	(.42)	.28	(.95)	-.00	(.29)	-.50	(1.00)	3.52	(4.72)
GPRV	1.21	(1.36)	.13	(.74)	.16	(.50)	2.24	(1.45)	.86	(.50)	.36	(1.37)	4.84	(7.45)
COMV	1.56	(1.72)	.01	(.78)	.12	(.44)	-.55	(1.49)	.35	(.48)	-.46	(1.80)	-3.02	(6.41)
FIND	.29	(.63)	.07	(.29)	-.17	(.22)	.50	(.63)	-.18	(.22)	-1.35*	(.61)	-2.53	(3.27)
FRED	-1.60*	(.73)	.24	(.52)	.46	(.28)	-.77	(.84)	-.51*	(.23)	-.93	(.79)	3.91	(3.37)
WRKD	.03	(1.14)	-1.59*	(.61)	.23	(.39)	-.10	(1.49)	.53	(.36)	-2.05	(1.35)	1.33	(4.10)
Constant	3.93	(14.18)	11.98	(6.71)	12.51*	(4.83)	-17.11	(16.02)	13.52*	(5.16)	27.46	(13.87)	5.35	(57.41)
R^2 (F)	.15	(.82)	.62	(2.87)	.09	(1.41)	.51	(1.92)	.19	(1.93)	.67	(2.00)	.81	(1.44)

*t significant at .05.
**t significant at .001.

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The effects of induced abortion on subsequent reproductive function and pregnancy outcome: Hawaii

Chin Sik Chung
and Patricia G. Steinhoff
in collaboration
with Roy G. Smith
and Ming-Pi Mi

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ABSTRACT This paper reports on an eight-year (1971–78) follow-up study of the effects of induced abortion on subsequent pregnancies and pregnancy outcomes among women in Hawaii. Follow-up was done by means of vital registration record-linkage of 16,961 women who had undergone induced abortions during the period 1970–74. The record-linkage identified 3,910 women who had one or more live births or spontaneous abortions after having had an induced abortion. These women were compared with a control group of 98,046 women having no known history of abortion. To complement data from vital registration records, clinical information was obtained from hospital records for 3,589 pairs of the abortion and control pregnancies matched on age and race of the women and on time of the event.

The pregnancy characteristics studied were short gestation, pregnancy complications, and labor complications. The pregnancy outcomes investigated were spontaneous fetal loss, ectopic pregnancy, low birth weight, congenital malformations, and infant death up to one year of age.

Comparisons revealed no difference between the abortion and nonabortion groups in overall rates of spontaneous fetal loss or in second-trimester fetal loss. The abortion group had a slightly higher rate of fetal loss than the control group in the first trimester of pregnancy. However, the increase in the early fetal loss rate can be explained by the competition between induced abortion and early fetal death. No significant association emerged between risk of spontaneous abortion and number of prior induced abortions.

The study found no overall relationship between history of induced abortion and subsequent ectopic pregnancy, but the incidence of ectopic pregnancy was five times greater among women who had had infection or retained secundines associated with prior induced abortion than among others in the abortion cohort. The risk of congenital malformations or postnatal death among subsequent live births was independent of a history of induced abortion.

Short gestation (< 37 weeks of gestation) was not affected significantly by prior induced abortion. Its incidence among nulliparous women with a history of single abortion was intermediate between that of the two control groups of nulliparous and parity 1 women. Rates of race-specific low birth weight were not significantly associated with a history of induced abortion. Nor was a significant association found between prior induced abortion and complications of pregnancy or labor. In general, women with a history of single abortion ranked between the nulliparous and parity 1 control groups in the incidence of such complications.

SUMMARY AND CONCLUSIONS

The present study was designed to study the effects of previous induced abortion on subsequent pregnancies and pregnancy outcomes. The pregnancy outcomes investigated were spontaneous fetal loss in each trimester, ectopic pregnancy, low birth weight, congenital malformations, and death of infants up to one year of age. The characteristics of subsequent pregnancies studied were short gestation, pregnancy complications, and labor complications.

The study was based largely on follow-up during 1971–78 of a cohort of women who had undergone induced abortion during the period of 1970–74 in Hawaii. The follow-up was carried out by means of record-linkage of the abortion cohort with birth and fetal death records filed at the State Department of Health. The record-linkage of 16,961 women in the abortion cohort identified 3,910 women who had one or more subsequent pregnancies that resulted in live birth or spontaneous fetal death. Selected for comparison with this group were women who had no known history of induced abortion as checked against the abortion cohort and the file of official induced abortion records. Altogether, 98,046 women formed the control group, which excluded repeat subsequent pregnancies of the same women. To complement the data from the vital registration records, we obtained additional clinical information on pregnancy and labor complications, congenital malformations, and women's reproductive history from hospital records for 3,589 pairs of the abortion and control groups matched for age, race, and time of the event.

An ancillary study was conducted on a sample of the entire data to investigate bias in the sampling of subsequent pregnancies, reliability of the vital records, completeness and validity of the record-linkage process, distribution of important confounding variables not reported in the vital records, and secondary infertility as a sequela of induced abortion. The study indicated that differential migration from Hawaii among women in the original abortion cohort tended to make those who remained more comparable to the control sample in their ethnic and age distributions. It also showed a high degree of completeness and validity of the record-linkage process. The vital records provided more complete information on a woman's experience of spontaneous abortion. An induced abortion was seldom reported as a spontaneous abortion. False negative history of induced abortion for the control women was estimated to be less than 5 percent. We found no significant differences between the abortion and control samples in their rates of smoking, alcohol consumption, and diabetes.

The vital data and the matched hospital data were analyzed separately. Using the Mantel-Haenszel χ^2 method, we analyzed the vital data stratified by maternal race, age, and parity (marital status in case of fetal loss). In the analysis of the stratified data, we classified parity in two ways: first, parity 0 versus parity 1 or more; and second, parity 0 for the abortion sample versus parity 1 for the control sample, and parity 1 or more for the abortion sample versus parity 2 for the control sample. The comparison of the nulliparous abortion sample with the uniparous control sample is of special significance because about half of all legal abortions in the United States are obtained by nulliparous women. The vital data were further analyzed by the multivariate logistic regression method. Next we examined the paired hospital data using McNemar's χ^2 test and multivariate logistic regression analysis. The hospital data were further tested for association of factors related to abortion procedure. The factors considered were age at first induced abortion, number of previous induced abortions, number of completed gestation weeks at last induced abortion, abortion procedure, use of laminaria, and abortion complications.

We examined subsequent fetal loss by trimester. Analysis of the vital data was somewhat hampered by the absence of information on reproductive history in fetal death records, although the hospital data corrected this deficiency. No significant association emerged between history of induced abortion and first-trimester fetal loss; the overall relative risk was 1.11. A theoretical consideration of competition between spontaneous abortion and induced abortion and different rates of unwanted pregnancies led to the conclusion that a small excess risk of early spontaneous abortion for the induced abortion sample is expected even in the complete absence of adverse effects of induced abortion. A slightly higher rate of first-trimester fetal loss was observed among subsequent pregnancies of women whose earlier pregnancy had been terminated by the suction procedure and sharp curettage or abortion procedure performed at less than nine weeks of gestation, than among women in the control group.

Prior induced abortion had no significant effect on second-trimester fetal loss during subsequent pregnancies, the estimated relative risk being 0.97. None of the abortion-related factors was found to be associated with the risk, although there was a nonsignificant increase in the risk with the D&C (dilation and curettage) procedure (relative risk = 1.59) There was a tendency for pregnancy outcomes of women with a history of induced abortion to be at lower risk of third-trimester fetal death than those of the control group, the statistical significance depending on whether or not parity effect was adjusted. Thus a slightly higher risk of first-trimester loss was compensated for by a lower risk for third-trimester fetal loss among women with a history of induced abortion. The relative risk was 1.01 for all types of fetal death.

We observed no significant association between induced abortion and ectopic pregnancy (relative risk = 1.26). Generally, there was no relationship between ectopic pregnancy and abortion procedure, use of laminaria, number of prior induced abortions, or length of gestation at the time of abortion. But there was a clear effect of the presence of postabortion infection or retained secundines on the risk of ectopic pregnancy, the incidence for pregnancies of women having a history of these complications being five times greater than for those without such complications.

Short gestation, defined as gestation length of less than 37 weeks, was not affected significantly by prior induced abortion, the estimated relative risk being 0.89. The apparently lower rate of short gestation among women in the abortion group was due to their having slightly greater gestation length (1.3 days) than the control group. Nulliparous women with a history of single induced abortion had a slightly lower rate of short gestation than the nulliparous control women, but they had a greater frequency of short gestation than the control women with parity 1. These findings suggest that the effect of induced abortion on gestation length of subsequent pregnancy is halfway between that of no previous pregnancy and that of a full-term pregnancy. Use of laminaria in prior induced abortion was associated with a lower rate of premature delivery than that of the control group.

We defined low birth weight using race-specific criteria: 2,500 grams for Caucasians and individuals of Hawaiian ancestry, 2,300 grams for non-Filipino Orientals, 2,200 grams for Filipinos, and 2,400 grams for other racial groups. Low birth weight unadjusted for gestation length showed a tendency similar to that observed in short gestation. When child's race and gestation length along with other covariates were allowed for in the logistic regression analysis, we could find no significant association between mother's history of induced abortion and low birth weight in subsequent pregnancies (relative risk = 0.92). The data also indicated that pregnancy outcomes of nulliparous women with a history of single induced abortion were intermediate between the groups of nulliparous and parity 1 control women. Multiple regression analysis of birth weight per se, with allowance for child's race, parity, and gestation length, revealed that the pregnancies of women in the abortion group resulted in a slightly but significantly greater average birth weight (38.3 grams) than those of the control group. This finding suggests that a prior pregnancy terminated artificially has some independent effect on birth weight of subsequent pregnancies but not as much as a full-term pregnancy.

No significant association could be detected between induced abortion and pregnancy complications in subsequent pregnancies, the relative risk being 1.10 with adjustment for covariates. However, the data indicate that a woman who has had an induced abortion is at higher risk of pregnancy complications in later pregnancy than a woman with one higher parity. But we found no difference between the abortion and control samples at the same parity levels. There was apparently more hyperemesis among women who had had induced abortions.

Labor complications followed a pattern similar to that of pregnancy complications. The overall relative risk was estimated to be 1.09. The data also suggested that a woman with a history of induced abortion has a higher risk of labor complications in subsequent pregnancies than if she had carried that earlier pregnancy to a full term.

The risk of congenital malformations was found to be independent of maternal history of induced abortion, the relative risk being 0.98 for the abortion group. Mortality of infants (under age one) born subsequently likewise showed no association with induced abortion of a prior pregnancy (relative risk of 0.99).

We conclude that in general there were few or no effects of prior induced abortion on subsequent pregnancies and pregnancy outcomes. Whatever minor effects demonstrated were found to be related to pregnancy order associated with induced abortion, not to induced abortion itself.

A general conclusion that can be drawn from the present study is that when induced abortion is carried out in a favorable medical setting, it will not increase the risk of any adverse consequences in subsequent pregnancies or pregnancy outcomes.

BACKGROUND AND AIMS OF STUDY

Induced abortion is considered to be the most commonly used surgical procedure (Sullivan et al., 1977) and accounts for about 30 percent of all pregnancies in the United States (Tietze, 1981). For a medical procedure practiced with such prevalence, it is imperative to know the long-term consequences. If there are risks of adverse effects of induced abortion on subsequent pregnancies or pregnancy outcomes, the risks must be precisely assessed.

Unfortunately, information on the subject is conflicting and clear agreement among published studies does not exist. Some of the observed international differences could be attributed to differences in the legal status of abortion, methods of abortion procedure, standards of health care, socioeconomic status of women seeking abortions, and demographic factors. In addition, differences in study design can account for inconsistent results between or within countries. Because of the recency of legalized induced abortion in the United States, data on its long-term effects are limited. Information available on the U.S. population up to this time also shows a disturbing inconsistency. The present analysis, which is based on a large prospective study, represents a further critical attempt to resolve the question concerning the risks of induced abortion.

Literature review

Inasmuch as long-term sequelae of induced abortion have received widespread attention in recent years, a large amount of literature has accumulated on the subject. We attempt no exhaustive review here but rather place emphasis on the critical consideration of major published studies. There are several general reviews on the subject of selected sequela variables (Tietze, 1981; Edstrom, 1975; Hogue, 1977; Cates, 1979; Grimes, 1979) that need not be duplicated here.

Late effects of induced abortion may be classified into the following categories: spontaneous fetal loss, ectopic pregnancy, low birth weight, short gestation, pregnancy complications, labor complications, congenital malformations, postnatal death, and secondary infertility. Available information on each of these conditions except secondary infertility is reviewed separately below. Since the requisites for studies of secondary infertility are distinct from those of studies of other sequela variables, that subject will be addressed in another report.

Spontaneous Abortion

Evidence is inconclusive concerning the relationship between induced abortion and spontaneous fetal loss at all stages of gestation (miscarriages and stillbirths), although available data are extensive.

Moriyama and Hirokawa (1966) found an increase in the rate of spontaneous abortion among women with a history of previous induced abortion in their retrospective study in Japan, which made no allowance for differences in maternal age or socioeconomic status between the case and control groups. Their study also showed that the rate of mid-trimester abortion was higher than that of first-trimester abortion, relative to the control group. The effect on mid-trimester fetal death was also noted by Wright et al. (1972), who reported a tenfold increase in the incidence of second-trimester abortion in pregnancies following induced abortion. Liu et al. (1972) questioned the magnitude of increased risk for mid-trimester abortion found by Wright et al., although they concurred on the presence of a significant relationship between the two factors. Pantelakis et al. (1973) found that 4.2 percent of pregnancies resulted in stillbirths among women admitting previous induced abortions, compared with 2.4 percent among women with no history of abortion in a study of patients in Athens. They noted no difference between the groups with induced abortion and with spontaneous abortion. Richardson and Dixon (1976), however, observed that the overall fetal loss among pregnant women having a history of vaginal termination was 17.5 percent, compared with 7.5 percent in a group of control patients who had had a spontaneous abortion earlier. In a similar comparison, Ratten and Beischer (1979) found a higher risk of mid-trimester spontaneous abortion for women with a history of induced abortion; they attributed one-half of this spontaneous loss to incompetent cervix. Other studies showing a positive association are by Dziewulska (1973) and Alberman et al. (1975).

On the other hand, studies showing no association between the two factors are equally numerous. Miltenyi (1964) found no increased risk of spontaneous abortion among women with a history of induced abortion in Hungary. Similarly, Roht and Aoyama (1973; 1974), in a study based on a mail survey and interviews, found no clear evidence of increased risk of either spontaneous abortion or stillbirth among women who had experienced induced abortion, although a more recent study by the same group of investigators claims an adverse effect of multiple induced abortions (Roht et al., 1976). Hogue (1975) found no association between induced abortion in first pregnancies with subsequent risk of spontaneous abortion or stillbirth in Yugoslavian women. Daling and Emanuel (1975; 1977) failed to detect any association between history of induced abortion and fetal loss in subsequent pregnancies under two diverse environments, Taiwan and the United States, using the matched-pair cohort design. Although Harlap and Davies (1975) demonstrated adverse effects of prior induced abortion on many aspects of subsequent pregnancies, they found no such effect on stillbirths. In an age-matched retrospective study in New York City, Kline et al. (1978) found no significant association between history of induced abortion and subsequent spontaneous fetal loss.

Recently, Harlap et al. (1979) reported a greater incidence of mid-trimester spontaneous abortion among nulliparous women with prior induced abortion than among the control women in the San Francisco area. They pointed out that the higher rate was largely among women who had had an abortion procedure in the early years of legalized abortion. Levin et al. (1980) reported a twofold to threefold increase in the risk of first-trimester spontaneous abortion and loss up to 28 weeks of gestation only for women who had had two or more prior induced abortions.

An international study coordinated by the World Health Organization (WHO, 1979) is highly revealing, pointing to underlying problems associated with the conflicting observations among regions and populations of the world. The study covered eight cities in Europe and grouped them into three clusters for analysis based on similarity of medical practice. Among the three clusters of cities, there was a significant association between history of induced abortion and mid-trimester spontaneous abortion in only one city cluster (East European cities), where dilation and curettage (D&C) was practically the only abortion procedure used. The study also showed that increases in the risk of mid-trimester abortion are similar in pregnancies preceded by D&C abortion or spontaneous abortion, in contrast to pregnancies preceded by a live birth.

In a summary of the results of seven major worldwide studies on mid-trimester spontaneous abortion, Tietze (1981) found that estimated relative risks varied widely, 0.71 to 3.13, with a limited number showing statistical significance, although some data were shown to lack the power of detecting a doubled risk.

Ectopic Pregnancy

Most of the observations of positive association between history of induced abortion and ectopic pregnancy have been in East European countries. Kotasek (1971) found an increase of ectopic pregnancy among women with previous induced abortion in Czechoslovakia. Beric and Kupresanin (1971) noted a secular trend of reduced ectopic pregnancy with widespread use of vacuum aspiration for induced abortion in the 1960–70 period in Yugoslavia, whereas Masic (1972) found a positive association between the frequencies of illegal abortion and subsequent ectopic pregnancy. No direct relationship could be established between the two factors, however, in a case-control study in Ljubljana, Yugoslavia, by Hren et al. (1974). In a study in Greece where elective abortion is illegal but practiced commonly, Panayotou et al. (1972) concluded that aborters had a tenfold greater risk of ectopic pregnancy than nonaborters.

Data originating in Japan show a negative association. Even though a study by Shinagawa and Nagayama (1969) of a small sample of clinical cases of ectopic pregnancy found a high percentage (68 percent) of women who had a history of induced abortion, a case-controlled study by Sawazaki and Tanaka (1966) of a large sample found no definite association between the two factors. Their findings were supported by another Japanese study (Roht and Aoyama, 1973). A limited amount of information is available on the U.S. population. A study of women in the Seattle area is inconclusive because of the small number of observations involved (Daling and Emanuel, 1977).

Low Birth Weight and Short Gestation

Low birth weight and short gestation are discussed together because of their close relationship. The term "prematurity" has been commonly used in the literature to denote underdevelopment of the newborn, as measured by birth weight. The birth weight of 2,500 grams is used as the criterion for prematurity in Caucasian populations. But prematurity as so defined yields no information as to whether the underdevelopment of a baby is due to a shorter than normal gestation period or to factors unrelated to gestation length.

Moriyama and Hirokawa (1966) reported that of women admitted to a Tokyo hospital for premature delivery (28–36 weeks of gestation), 32 percent had had a prior induced abortion, compared with 21 percent of the control group admitted for full-term delivery. Also in Japan, Roht and Aoyama (1973; 1974) found no significant difference in the incidence of low birth-weight babies between their abortion cohort and the control group. But they reversed that conclusion in a subsequent analysis (1976).

Data from Eastern European countries tend to show positive associations between history of induced abortion and low birth weight or short gestation. Dolezal et al. (1970) reported a significantly higher incidence of prior abortion among 189 women who experienced short gestation than among 197 controls. Similar results were reported by Miltenyi (1964) and Atanasov et al. (1972). Czeizel et al. (1970) raised the possibility that an increased number of low birth-weight infants may have been due to a high rate of induced abortions in Hungary.

Pantelakis et al. (1973) reported that the rate of premature delivery among women with a history of induced abortion was about double that of a control group in Greece. This finding was supported by Papaevangelou et al. (1973), who found a similar association between short gestation and prior spontaneous abortion. But the latter group of investigators concluded that there was no adverse effect of previous induced abortion on birth weight independently of premature delivery. Harlap and Davies (1975) reported a 34 percent greater incidence of low birth weight among women with a history of induced abortions than in a control group.

More recent studies in which confounding variables are better controlled show no association of induced abortion with low birth weight or short gestation. Hogue (1975) detected no significant difference in the frequency of low birth weight among abortion and nonabortion Yugoslavian women, as did Obel (1979a) with a Danish population. Daling and Emanuel found no effect of previous abortion on either length of gestation or the rate of low birth weight among women in Taiwan (1975) or the United States (1977). Similar findings were reported from Boston by Schoenbaum et al. (1980). The 1979 WHO study showed significantly greater frequency of short gestation among mothers who had terminated the first pregnancy by vacuum aspiration than among mothers who had had only a prior live birth (5.7 versus 2.0 percent). On the other hand, Obel (1979b) observed that among women with a history of induced abortion a higher risk of low birth weight was associated with cervical canal dilatation greater than 12mm. and with recurettage.

Summarizing a number of major studies, Tietze (1981) concluded that the average relative risks for abortion groups were 1.08 and 1.05 for low birth weight and short gestation, respectively. He further noted that the relative risks were higher when the study groups with only a single induced abortion were compared with the controls of parity 1.

Congenital Malformations

Data are limited on congenital malformations in subsequent pregnancies as a sequela of induced abortion. Daling and Emanuel found no greater risk of congenital malformations in babies born subsequent to induced abortion than in the control group either in Taiwan (1975) or in the United States (1977). But Harlap and Davies (1975) reported a higher incidence of both major and minor congenital malformations among an abortion cohort in Israel.

Polednak and Oski (1976) observed a secular parallelism between the general incidence of oral clefts and legalization of induced abortion in upstate New York, but could establish no causal relationship. Two recent studies on U.S. populations (Schoenbaum et al., 1980; Bracken and Holford, 1979) demonstrated no association between prior induced abortion and risk of congenital malformations in subsequent pregnancies.

Postnatal Death

Findings on postnatal death rates as a function of previous abortion history are equally confusing. In an Israeli sample, substantially higher than normal rates of early and late neonatal death were observed among infants of mothers with a history of induced abortion (Harlap and Davies, 1975). The results were negative in studies in Taiwan (Daling and Emanuel, 1975) and the United States (Daling and Emanuel, 1977; Schoenbaum et al., 1980).

Pregnancy Complications

As with congenital malformations, data are limited on complications of pregnancy as a sequela of previous induced abortion. In their prospective study of Israeli women, Harlap and Davies (1975) found a greater occurrence of bleeding during the first trimester among the abortion group than among the controls, but no difference in blood-group isoimmunization, toxemia, and hydramnios. Dziewulska (1973) and Atanasov et al. (1972) also reported more bleeding during subsequent pregnancies of women with a history of induced abortion. Among several factors studied, Obel (1979a) found a higher incidence of bleeding before 28 weeks of gestation for previous aborters than for control women.

In contrast, Furusawa and Koya (1966) found no association between previous induced abortion and pregnancy complications. Schoenbaum et al. (1980) observed that women of second gravidity who had had a single induced abortion resembled nulliparous control women in their rates of first-trimester bleeding and toxemia of pregnancy.

Labor and Delivery Complications

Studies report conflicting results on labor and delivery complications. Furusawa and Koya (1966) found no significant difference between controls and previous aborters in their rates of instrumental delivery, amount of bleeding, or length of third stage of labor; although the authors suggested a possibility of moderately longer first and second stages of labor for the aborter group. Czeizel and Bognar (1971) suggested a possible relationship between a rising incidence of induced abortions and delivery complications due to placenta previa or premature detachment of placenta. On the contrary, Atanasov et al. (1972) reported fewer delivery complications among women with a history of induced abortion.

Other investigators claim to have found more definite adverse effects of induced abortion on labor and delivery. Clow and Crompton (1973) pointed out a substantial increase for previous aborters in the risk of uterine rupture during subsequent pregnancy among women with a history of hysterotomy. Slunsky (1964) observed among abortion women a higher incidence of premature labor and slightly greater frequency of operative intervention or excessive hemorrhage than in the control group. Dziewulska (1973) noted that prolongation of the third stage of labor was more common for women who had previous induced abortion than for his control group, a finding that appears to be supported by data from Israel (Harlap and Davies, 1975).

However, more recent studies by Obel (1979a) and Schoenbaum et al. (1980), with better control of confounding factors, showed no definitive association between induced abortion and selected delivery-complication variables.

In a follow-up study in California, Madore et al. (1981) examined various sequela variables together, including spontaneous abortion, ectopic pregnancy, neonatal death, low birth weight, and congenital malformations. Adverse outcome as defined by all of these factors was slightly greater among women with a history of induced abortion, but the relative risk was barely significant (1.45).

Aims of this study

From the preceding discussion, it is clear that in no specific area could we find agreement or consistency among different investigators on the effects of induced abortion on subsequent pregnancies. It is difficult to assess the extent to which the observed inconsistencies among studies are a reflection of true differences, faulty study design, or incomplete control of confounding variables. Even under the best conditions of study design and data analysis, some inconsistency in results may be expected, for confounding social, demographic, and health-care conditions are known to vary among different regions and countries, as illustrated by the 1979 WHO study. Given the methodological difficulties, well summarized by Hogue (1979), it seems unproductive to generalize from studies carried out under different conditions. The value of a well-designed study with good control of confounding factors under a specific condition cannot be overemphasized.

The present study attempts to clarify the issue by using a prospective study design to analyze the relative risks of induced abortion among a large sample of women in Hawaii. The association between induced abortion and complications of later pregnancy and birth is examined. Also evaluated are the possible risks of induced abortion in relation to variables associated with the abortion itself, including procedure used, number of abortions, abortion complications, gestation stage at induced abortion, and age at first induced abortion.

STUDY PLAN AND MATERIALS

General design of the study

In general, the present study followed a historical prospective design. A cohort of women (abortion cohort) who had documented records of induced abortions performed during the period of 1970–74 were followed up for subsequent pregnancies through the vital registration system of the Hawaii State Department of Health. The follow-up period was 1970 through 1978. Attributes of pregnancies and their outcomes were compared with those of the control women, who had no known history of induced abortion. The characteristics of pregnancy and pregnancy outcome under study were pregnancy complications, labor and delivery complications, fetal death (spontaneous abortion and stillbirth), ectopic pregnancy, short gestation, low birth weight, congenital malformations, and postnatal death to one year of age.

Two types of controls were used for comparison. The first control consisted of all pregnancies reported as live births or fetal deaths among women who had no known history of induced abortion (referred to as "elective abortion" by the Health Department). Repeat pregnancies of the same women were excluded from analysis for both the abortion and the control groups. The second control was a subset of the preceding control pregnancies that were matched against the pregnancies of women with histories of induced abortion on the basis of race, maternal age, and time of occurrence of the subsequent event (birth or spontaneous abortion).

Abortion cohort

The State of Hawaii is one of the first states to legalize induced abortion. The law, which became effective in March 1970, originally had the provisions that: (1) the abortion procedure be performed prior to the stage of extrauterine viability of the fetus, (2) the procedure be carried out in an accredited hospital, and (3) the women treated be resident in the state for a minimum of 90 days immediately before the date of abortion. The latter two provisions were declared invalid in October 1974 by the State Attorney General after the 1973 U.S. Supreme Court decisions on the subject.

The Hawaii Pregnancy, Birth Control, and Abortion Study (HPBCA) was initiated to assess effects of the new state law on the use of induced abortion for birth control and to investigate personal decision-making processes (Smith et al., 1971; Steinhoff et al., 1972; Diamond et al., 1973; Steinhoff et al., 1975; Smith et al., 1976; Smith et al., 1978). The study included all cases of induced abortions from March 1970 through June 1974 that were performed in all Hawaii hospitals except for a few small remote hospitals. Medical and demographic information was obtained from hospital records on each case by personnel assigned by the project. The cohort consisted of 16,961 women who had had a total of 18,786 induced abortions. In addition, social and attitudinal information was collected on an 85 percent sample of the cases. The distribution of the 18,786 abortions by month and year of occurrence is given in Table 1. Of these abortions, there was no identifying information on 255 cases that could not be followed up for the present investigation. Thus 18,531 previous abortions of 16,719 women whose subsequent pregnancies could be followed up are the subject of the present study.

The original study provided for the present study the following critical information on each induced abortion of the abortion cohort: date of abortion, estimated maximum gestation time, abortion procedure used, use of laminaria and oxytocin, and complications associated with the procedure. In addition the study collected reproductive histories of the women and other pertinent information. These will be discussed in detail in another section.

TABLE 1 Number of abortions of cohort women, by month and year of abortion

Month	1970	1971	1972	1973	1974	All
January		332	389	416	416	1,553
February		301	360	389	370	1,420
March	222	353	448	433	396	1,852
April	293	376	403	377	362	1,811
May	292	344	428	404	375	1,843
June	300	355	370	394	353	1,772
July	351	386	376	387		1,500
August	298	386	416	433		1,533
September	315	385	388	346		1,434
October	306	371	364	371		1,412
November	264	317	351	346		1,278
December	317	367	337	357		1,378
Total	2,958	4,273	4,630	4,653	2,272	18,786

Record-linkage

Initially, the records of the induced-abortion cohort were linked with those of fetal death certificates filed at the State Health Department. By law, all fetal deaths, including spontaneous abortions and induced abortions, are reportable to the Health Department in Hawaii. Subsequently, the abortion cohort data were also linked with the file of birth certificates because it was found that a few induced abortions were reported as live births immediately followed by postnatal death.

There were several reasons for this initial step. First, we wished to test the yield and reliability of the record-linkage process with the clearly documented basic data of the abortion cohort. Second, some information on the cohort women from the vital registry records could be used in comparison with the control group. Third, we were interested in knowing the degree of completeness and accuracy to which induced abortions were reported to the Health Department. And fourth, we wanted to explore the possibility of an induced abortion being misreported as a spontaneous abortion in the official file.

The details of that study and its findings are reported elsewhere (Chung et al., 1979; Chung et al., 1981). Therefore, only a brief summary is presented here. The data used in linking the two files to the same event were: first name, maiden name, age and race of the woman, and date and place (hospital code used) of the event. When an absence or ambiguity of maiden name existed, the other last name was also used for the linking purpose. A match was declared when there was no discrepancy in these items of information between the two sets of records. Occasional questions on race occurred with persons of mixed ancestry, particularly when a woman was part-Hawaiian. A woman with mixed Hawaiian background might call herself a part-Hawaiian, or she might list some or all of her ancestral background. For cases like this, the match was considered complete as long as the Hawaiian component was stated in both files, provided no discrepancy was present in other items of information. For these cases, individual judgment had to be made.

Table 2 shows the result of matching all identified cohort abortions with the records of fetal death and birth files by year. The rate of match is indeed high, 96.1 percent over all the years. There was gradual improvement each year until 1974, when the abortion procedure was allowed to take place in clinics for the first time. Our estimate of matching rate is conservative because our criteria of match were

TABLE 2 Matches of identified induced abortions with records of fetal death and live birth, by year

Year	Total in abortion file	Matches with fetal death	Matches with live birth	Not matched	Proportion of matches
1970	2,870	2,728	2	140	0.951
1971	4,191	4,083	1	107	0.974
1972	4,591	4,488	0	103	0.978
1973	4,632	4,471	2	159	0.966
1974	2,247	2,025	0	222	0.901
Total	18,531	17,795	5	731	0.961

stringent. Taking account of other factors, however, we estimated that the rate of reporting induced abortions performed in hospitals to the State Health Department was 97.4 percent, with a maximum estimate of 98.8 percent (Chung et al., 1979).

Table 3 classifies 17,800 linked cohort cases by year of occurrence, type of abortion (elective or therapeutic), and source of information. The vital registry system recorded 98.75 percent of the cohort abortions as elective or therapeutic. Within the category of elective induced abortion as reported by hospitals, 98.72 percent were also reported as such in the vital registration. The "other" group as classified by the vital registration includes five cases that were reported as live births, although all of these were also registered as postnatal deaths occurring on the same date. Twenty-nine cases of induced abortion in the abortion cohort were classified as spontaneous abortion or miscarriage in the vital registry data. The rate of this type of misclassification was 1.7 per 1,000, which is negligible for all practical purposes. Nearly all of the "other" category were unspecified or unknown for cause of fetal death. The small observed rate of misclassification of induced abortion as spontaneous abortion in the vital registration records indicates a high degree of reliability of the vital data as a source of study for spontaneous abortion distinguished from induced abortion.

Subsequent pregnancy outcomes of the cohort women were searched by using essentially the same linking process as above, although the information on date of the event and hospital were not useful except for special cases. Table 4 shows the distributions of the cohort women by race and age at the time of first observed induced

TABLE 3 Elective and therapeutic abortions, by source of data

Year and classification in abortion file	Total	Classification in vital records		
		Elective	Therapeutic	Other
1970				
Elective	2,676	2,601	4	71
Therapeutic	54	27	22	5
1971				
Elective	4,029	3,956	3	70
Therapeutic	55	31	16	8
1972				
Elective	4,430	4,396	6	28
Therapeutic	58	35	18	5
1973				
Elective	4,420	4,389	5	26
Therapeutic	53	42	11	0
1974				
Elective	1,995	1,984	1	10
Therapeutic	30	24	6	0
All years				
Elective	17,550	17,326	19	205
Therapeutic	250	159	73	18

abortion and of a subset of these women who had at least one reported subsequent pregnancy resulting in a live birth or spontaneous fetal death during the period 1971–78. Because of only one observed subsequent pregnancy in 1970, that year is excluded from further consideration. Table 4 also shows the distribution of reported births and spontaneous fetal deaths for 1975 (Hawaii Department of Health, 1975) for comparative purposes. The race of women was classified into five categories: Caucasian, Hawaiian or part-Hawaiian, Filipino, Oriental, and Other. Hawaiian and part-Hawaiian were pooled because of their general similarity in cultural and socioeconomic background and the difficulty of specifying racial components for part-Hawaiians. Japanese, Chinese, and Koreans were combined to form the Oriental group since these groups have similar cultural and socioeconomic characteristics and there were relatively fewer Chinese and Koreans in

TABLE 4 Distributions of cohort women, cohort women having at least one subsequent live birth or spontaneous fetal death, and general population in 1975, by race and age at initial induced abortion

Race and age group	All cohort women (1970–74)		Cohort women with subsequent pregnancy (1971–78		General population (1975)	
	Number	Prop.	Number	Prop.	Number	Prop.
Caucasian						
<20	1,511	.0945	355	.0908	742	.0431
20–24	2,571	.1608	474	.1212	2,301	.1337
25–29	1,232	.0771	182	.0465	1,857	.1079
>29	1,083	.0677	77	.0197	979	.0569
All age groups	6,397	.4001	1,088	.2783	5,879	.3416
Hawaiian and part-Hawaiian						
<20	657	.0411	369	.0944	856	.0497
20–24	677	.0423	326	.0834	1,364	.0793
25–29	370	.0231	110	.0281	856	.0497
>29	406	.0254	45	.0115	492	.0286
All age groups	2,110	.1319	850	.2174	3,568	.2073
Filipino						
<20	376	.0235	191	.0488	399	.0232
20–24	516	.0323	233	.0596	994	.0578
25–29	353	.0221	128	.0327	894	.0519
>29	483	.0302	58	.0148	781	.0454
All age groups	1,728	.1081	610	.1560	3,068	.1783
Oriental						
<20	1,171	.0732	351	.0898	219	.0127
20–24	1,647	.1030	533	.1363	699	.0406
25–29	842	.0527	202	.0517	1,401	.0814
>29	1,303	.0815	86	.0220	1,042	.0605
All age groups	4,963	.3104	1,172	.2997	3,361	.1953
Other						
<20	176	.0110	60	.0153	203	.0118
20–24	312	.0195	85	.0217	564	.0328
25–29	167	.0104	37	.0095	372	.0216
>29	136	.0085	8	.0020	194	.0113
All age groups	791	.0494	190	.0486	1,333	.0775
Total	15,989	1.0000	3,910	1.0000	17,209	1.0000

the sample. The "Other" category consisted of heterogeneous groups including other unmixed ethnic groups and interracial crosses other than part-Hawaiians. Individuals of unknown racial origin or age are not included in the table.

The table includes only those cohort women whose induced abortions were reported to the State Health Department, as evidenced by record-linkage and by valid information on race and age at the time of the recorded induced abortion. Among the 15,989 initial cohort women, 3,910 were reported to have had subsequent pregnancies. It is clear that the cohort women who became pregnant subsequently and had a live birth or spontaneous fetal loss were not a random sample of the original cohort. Among these women, there were fewer Caucasians and, as expected, more young women. The decrease of Caucasian women among those having repeat pregnancies can be partly explained by the fact that a large number of these women were the spouses of military personnel having limited tours of duty in Hawaii and therefore the women were lost to follow-up. The racial distribution of women who had subsequent pregnancy outcomes of live birth or spontaneous fetal loss better approximates the distribution of the general population of Hawaii as seen in Table 4. There was a somewhat higher frequency of Oriental women among the women who later became pregnant again than among the general population of 1975.

Table 5 shows reported first subsequent pregnancies of the abortion cohort women by type of pregnancy outcome, race, and age at initial induced abortion. The overall frequency of fetal death among these pregnancies was 9.59 percent, which includes all types of spontaneous fetal deaths except for induced abortions. Overall, 24.5 percent of the cohort women had one or more ascertained subsequent pregnancies that resulted in delivery or spontaneous abortion during the period, the lowest proportion being 17.0 percent for Caucasians and the highest 40.3 percent for Hawaiians and part-Hawaiians. Of the 3,910 women in this group, 1,533 or 39.2 percent had repeated subsequent pregnancies reported as delivery or spontaneous abortion (Table 6).

Controls

Two types of controls were formed for the purpose of comparison with pregnancies of the abortion cohort women. The first control group was derived from all registered births and spontaneous abortions of women who had no known record of induced abortion during the

TABLE 5 Distribution of cohort women having subsequent pregnancy, by race, age at first induced abortion, and outcome type, and proportion of cohort women having reported subsequent pregnancy

Race and age group	Live births	Fetal deaths	Total	Total number in cohort	Prop. of cohort women with subsequent pregnancy
Caucasian					
< 20	321	34	355	1,511	.2349
20–24	428	46	474	2,571	.1844
25–29	157	25	182	1,232	.1477
> 29	57	20	77	1,083	.0711
All age groups	963	125	1,088	6,397	.1701
Hawaiian and part-Hawaiian					
< 20	346	23	369	657	.5616
20–24	296	30	326	677	.4815
25–29	98	12	110	370	.2973
> 29	40	5	45	406	.1108
All age groups	780	70	850	2,110	.4028
Filipino					
< 20	184	7	191	376	.5080
20–24	222	11	233	516	.4516
25–29	114	14	128	353	.3626
> 29	47	11	58	483	.1201
All age groups	567	43	610	1,728	.3530
Oriental					
< 20	320	31	351	1,171	.2997
20–24	493	40	533	1,647	.3236
25–29	183	19	202	842	.2399
> 29	67	19	86	1,303	.0660
All age groups	1,063	109	1,172	4,963	.2361
Other					
< 20	54	6	60	176	.3409
20–24	67	18	85	312	.2724
25–29	34	3	37	167	.2216
> 29	7	1	8	136	.0588
All age groups	162	28	190	791	.2402
Total	3,535	375	3,910	15,989	.2445

TABLE 6 Distribution of cohort women having subsequent pregnancy, by number of subsequent pregnancies, race, and age at first induced abortion

Race and age group	Only one subsequent pregnancy	Two or more subsequent pregnancies	Total
Caucasian			
< 20	211	144	355
20–24	309	165	474
25–29	127	55	182
> 29	59	18	77
All age groups	706	382	1,088
Hawaiian and part-Hawaiian			
< 20	172	197	369
20–24	177	149	326
25–29	66	44	110
> 29	34	11	45
All age groups	449	401	850
Filipino			
< 20	96	95	191
20–24	135	98	233
25–29	97	31	128
> 29	46	12	58
All age groups	374	236	610
Oriental			
< 20	198	153	351
20–24	351	182	533
25–29	145	57	202
> 29	70	16	86
All age groups	764	408	1,172
Other			
< 20	21	39	60
20–24	36	49	85
25–29	20	17	37
> 29	7	1	8
All age groups	84	106	190
Total	2,377	1,533	3,910

period 1971–78. For this period, all live births and spontaneous fetal deaths minus pregnancy outcomes linked with the abortion cohort women were further linked with the file of induced abortions obtained from the vital registration system. If a live birth or spontaneous fetal death was preceded by an induced abortion for the same woman, the outcome was eliminated from this general control group. In order to detect repeat pregnancies among the remainder, all records were linked with one another on the basis of names of infants' parents (family name and initials of first and middle names), and their birth year. Parental races and pregnancy order were further used for checking the consistency of linked records. This phase of linkage was done in the laboratory of Dr. Ming-Pi Mi as part of his ongoing research project. The elimination of these repeated pregnancies left 98,046 deliveries or spontaneous abortions during the period 1971–78 for the control. Table 7 shows the distribution of the sample by maternal race and age at the time of the outcome event. The control formed in this manner has the risk of inducing "false negative" cases in whom the induced abortion experience of the pre-1970 period is not recognized. The degree of possible contamination and its effects on the results of analysis will be discussed in later sections.

The control sample described above suffers from a certain weakness, although the size of the sample is sufficiently large to make up for some deficiencies. The vital registration data are incomplete for the reproductive history of many women who had spontaneous abortions, and reports on complications of pregnancy or delivery and congenital malformations could be incomplete or nonspecific. To correct for these problems, we formed the second control group by matching with the abortion cohort subsequent pregnancies reported during the period 1970–76. The matching was done on the basis of maternal racial group, maternal age at the time of subsequent event, and time of occurrence of the event. For the matching purpose, race was classified into the five groups described earlier, whereas age was in years. For time of occurrence, a control was considered to be matched with the cohort case when the control event took place within the same month or within one month before or after the cohort event. Parity or pregnancy order was not one of the matching criteria because, unfortunately, no such information was recorded by the vital registration system for spontaneous abortions occurring before 16 weeks of gestation; for such cases an abridged or "short" form was employed. Ex-

TABLE 7 Control pregnancy outcomes, by race and age

Race and age group	Total number of outcomes	Number of outcomes excluding repeated pregnancies
Caucasian		
<20	5,504	5,194
20–24	17,965	15,302
25–29	14,447	11,320
>29	8,156	6,032
All age groups	46,072	37,848
Hawaiian and part-Hawaiian		
<20	6,244	5,556
20–24	10,215	6,514
25–29	6,608	3,615
>29	4,109	2,554
All age groups	27,176	18,239
Filipino		
<20	3,114	2,782
20–24	7,024	4,877
25–29	6,705	4,227
>29	5,903	3,755
All age groups	22,746	15,641
Oriental		
<20	1,601	1,517
20–24	5,440	4,278
25–29	10,897	7,504
>29	8,393	5,333
All age groups	26,331	18,632
Other		
<20	1,530	1,398
20–24	3,990	3,165
25–29	2,625	1,911
>29	1,599	1,212
All age groups	9,744	7,686
Total	132,069	98,046

cluded from the cohort of subsequent pregnancies were multiple births, outcomes with no hospital code, and outcomes that took place in a hospital different from the hospitals used for earlier induced abortions.

For all of the matched cohort and control pregnancies, hospital maternity records were searched to obtain additional information on reproductive history of the woman, pregnancy complications, labor and delivery complications, congenital malformations, and postpartum complications. The information on congenital malformations was less complete for babies delivered at Tripler Army Medical Center, where infant records were filed separately from the maternity records, than at the other hospitals.

The matching process produced a total of 3,589 pairs of observations for the abortion and control groups. However, detailed reviews of hospital records revealed a small number of incorrect entries for events reported to the State Health Department as spontaneous fetal deaths. These included 12 suspected pregnancies that proved to be false (eight in the abortion group and four in the control group), six cases of septic abortions equally distributed between the two groups, and 18 cases of induced abortions (13 in the abortion group and five in the control group). All of the pairs with these types of discrepancies were excluded from pairwise comparisons. Excluded also were pairs of observations in which an IUD *in situ* was detected at the time of delivery, or there was a documented history of induced abortion (79 cases) according to hospital and Health Department abortion records. When these exclusions were made, 3,416 pairs of observations remained for matched comparison. All valid data were used, however, when analysis was confined to the abortion cohort. Table 8 shows the number of pairs by race and maternal age.

The observations on the control sample yielded some information about the magnitude of the presence of "false positive" individuals in the group in the main study. With 3,589 subjects as the base, the 79 cases having a documented history of induced abortion represented only 2.20 percent of the sample. This degree of contamination of the control sample is not likely to affect the results of the main study significantly. We will discuss this issue further in the section on the ancillary study.

ANCILLARY STUDY

Purpose of the ancillary study

The main study design described above assumes that: (1) the women followed up and ascertained to have had subsequent pregnancies were

TABLE 8 Number of paired observations, by race and maternal age

Race and age group	Number of pairs
Caucasian	
<20	111
20–24	326
25–29	262
>29	137
All age groups	836
Hawaiian and part-Hawaiian	
<20	182
20–24	405
25–29	206
>29	85
All age groups	878
Filipino	
<20	73
20–24	210
25–29	167
>29	99
All age groups	549
Oriental	
<20	96
20–24	358
25–29	327
>29	156
All age groups	937
Other	
<20	31
20–24	94
25–29	67
>29	24
All age groups	216

a representative sample of the abortion cohort, (2) the data obtained from record-linkage portray real events with completeness and accuracy, (3) the control subjects had no positive history of induced abortion, and (4) such possible confounding variables as diseases, smoking of cigarettes, and use of alcohol or drugs are evenly distributed between the abortion and control groups. The main study design, however, did not enable us to address the important question of effects of induced abortion on secondary infertility. (That subject will be the topic of another report.) In order to explore this question, an ancillary study was designed.

Design of the ancillary study

A sample of 1,200 elective abortion subjects and 1,200 control subjects who had subsequent births or spontaneous abortions was drawn from the pool of 1970–74 vital statistics records. The sample was distributed across the four years so that case loss over time could be studied. To maximize the availability of background data, we further restricted the sample to two periods of a month each in each year during which the abortion recipients and live-birth controls had been studied extensively earlier (Steinhoff et al., 1975; Diamond et al., 1973; Steinhoff et al., 1979). The eight subsamples were stratified by age and ethnicity to correspond to the population base from which they were drawn. A supplementary sample was also drawn of women with induced abortion histories who had already been record-linked to a subsequent birth or spontaneous abortion. This was done to ensure that sufficient cases of subsequent pregnancy would be available for the study of confounding variables. The supplemental sample was stratified by age and ethnicity to match the pool of women with subsequent pregnancies as determined by the record-linkage. The sample was combined for all aspects of data collection and processing, but excluded from analyses where the research design called for comparison of the original abortion and control samples.

Using available public records, commercial services, and personal contacts, we made every effort to locate the sample women. Once located, the women were asked to participate in an interview that would enable us to study methodological and substantive questions that could not be addressed by the record-linkage alone. Records of the location effort itself, however, constitute the data for examination of retention bias.

The first step in the research strategy was to comb available public records such as voter registrations, telephone directories, and city directories, for an address or telephone number. Whenever possible, a second source was used to verify the information, particularly if there was not a complete and direct listing of the woman's own name. The Hawaiian Telephone Company was most helpful in verifying whether a given name and address corresponded to their records for a party with an unlisted telephone number.

When a "good" address was found, a letter requesting the interview was sent. If the letter was returned by the post office, postal forwarding services were requested and the search continued. If the letter was not returned, the subject was assigned to an interviewer for telephone or personal contact. Some of these cases could no longer be reached at the address or telephone number listed, and the search continued for them.

When the readily available sources had been exhausted, several additional approaches were used. Two commercial services were tried. One, a telephone check-verification service, located very few names because its records contained only the names of people whose checks had been returned by banks as unnegotiable. The other, a commercial search firm linked to a chain of credit agencies, was moderately successful in locating women not found in the basic public records.

More effective than these services was the tactic of calling persons listed in the phone directory with the same last name and inquiring about the whereabouts of the subject. This was done whenever there were relatively few listings. The callers were careful to provide only minimal information about the purpose of the call, in order to protect the privacy of persons in the sample. The calls often reached a woman's relatives, who could either make direct contact or suggest another person who might know her whereabouts. Several deaths and out-of-state addresses were also reported. When no phone number was found, and particularly on the rural neighbor islands, an interviewer was sent to the last known address to inquire at the residence and in the neighborhood.

The location effort was conducted between 1978 and 1980, a minimum of four years and a maximum of ten after the event for which the woman had been sampled. It was terminated when all reasonable attempts to locate the missing subjects had been carried out and when the cost of further searches would have been prohibitive.

We are certain that many of the unlocated women are no longer in the state, even though their departure could not be verified. We are equally certain that many of the unlocated women are still in the state, but it was no longer reasonable to keep searching for them. Shortly after the location process ended, for example, one elusive subject became the subject of a front-page newspaper article.

Subjects who were found in the state were asked to participate in a personal interview on matters related to women's health and fertility. Case loss due to our failure to locate subjects, refusal, and semi-refusal is shown in Table 9. The semi-refusal category includes women who declined to be interviewed, but agreed to fill out a mailed questionnaire. After careful consideration, however, we decided that the amount of additional information that might be obtained from a mailed questionnaire did not warrant the expense. The interview sample for this part of the study contained 315 abortion cases and 393 control cases, plus 99 supplemental sample cases.

The interview protocol included a carefully collected fertility history, information on a variety of health and fertility-related topics, and special focus on each pregnancy and its outcome. Data were also collected on name changes and periods when the respondent was not living in the state. Most of the fertility history data relevant to the present analysis were collected by means of a time-line or life-history technique designed to facilitate recall of events by association and to maximize the accuracy of the dates of events.

The interviews were conducted by carefully selected and specially trained female interviewers. They were trained to encourage reporting of induced abortions and to be nonjudgmental about any fertility-related behavior reported. All interviews were conducted double-blind. Neither the interviewer nor the respondent knew why the respondent had been selected, or what the precise research questions were. These procedures protected the respondent's privacy and the neutrality of the interview, while encouraging complete and accurate reporting of fertility history.

Further details on the plan of this substudy are described elsewhere (Chung et al., 1981).

Retention rates

In this substudy we located 517 cases of the abortion cohort and 603 cases of the control sample who were ascertained to be definitely in the state of Hawaii at the time of the study. Altogether, 103 cases of the abortion cohort and 52 cases of the control were found to be either deceased or definitely out of the state (Table 10).

In order to assign the remainder of the sampled subjects to in-state or out-of-state status, two methods were used. These methods were described in detail in Chung et al. (1981). Briefly, the method referred

TABLE 9 Case loss from original samples due to loss to follow-up and interview refusal

	Location process					Interview acceptance			
Sample	Deceased	Found out of state	Lost to follow-up	Found in state	Total sample drawn	Refused	Agreed to mail questionnaire	Interviewed	Total cases found
Control									
Number	4	49	543	603	1,199	122	88	393	603
% of total	0.3	4.1	45.3	50.3	100	10.2	7.3	32.8	
% of cases found	*	*	*	*	*	20.2	14.6	65.2	100
Abortion									
Number	5	98	580	517	1,200	129	73	315	517
% of total	0.4	8.2	48.3	43.1	100	10.7	6.1	26.2	
% of cases found	*	*	*	*	*	25.0	14.1	60.9	100
Abortion supplement									
Number	0	18	104	151	273	31	21	99	151
% of total	0	6.6	38.1	55.3	100	11.4	7.7	36.3	
% of cases found	*	*	*	*	*	20.5	13.9	65.6	100

* Less than 1%.

TABLE 10 Location statuses in 1980 estimated by staff assignment and depreciation methods, by sample

Location status	Abortion sample				Control sample			
	Staff assignment		Depreciation		Staff assignment		Depreciation	
	N	%	N	%	N	%	N	%
In state								
Found in state	517	43.08	517	43.08	603	50.25	603	50.25
Probably in state	275	22.92	293	24.42	200	16.67	273	22.75
Subtotal	792	66.00	810	67.50	803	66.92	876	73.00
Not in state								
Deceased or found out of state	103	8.58	103	8.58	52	4.33	52	4.33
Probably out of state	305	25.42	287	23.92	345	28.75	272	22.67
Subtotal	408	34.00	390	32.50	397	33.08	324	27.00
Total	1,200	100.00	1,200	100.00	1,200	100.00	1,200	100.00

to as staff assignment was based on the subjective judgment of the project staff who were quite familiar with the local population. A case of unknown location status was assigned to one or the other class based on their best judgment. The method of assignment called depreciation is based on the principle that the probability of a subject's being in the state depreciates with succeeding years of our failure to locate her. The depreciation method has advantages in that it is objective and takes no other demographic factors into consideration in the process of assignment. Therefore, analysis of retention bias was based on the data classified by the method.

As Table 10 shows, the depreciation method generally yielded higher rates of being located in-state than the staff assignment method. Table 11 shows that Hawaii-born, non-Caucasians, and older women were more likely than others to be in the state. For a given group, the retention rate was expected to decrease with each succeeding year to the last year (1980) for this substudy. However, the critical period of concern should have coincided with the period of record-linkage, which ended in 1978.

Table 12 shows the estimated rates of in-state retention for the abortion and control samples by demographic characteristics for the record-linkage period. In general, the control sample had slightly larger in-state rates. At the end of the record-linkage period, 76.33 percent of the abortion sample and 80.58 percent of the control sample were estimated to be still residing in the state.

Factors associated with retention

As shown in Table 12, women born in Hawaii were most likely to have remained in the state throughout the record-linkage period, whereas women born on the U.S. mainland were most likely to have left, in both samples. Foreign-born women in the abortion sample were somewhat more likely than foreign-born control women to have left the state.

Birthplace in itself is not a critical factor for the analysis, but it is closely related to ethnicity. As expected, Caucasian women had a much higher rate of case loss than Japanese and Chinese or Hawaiian and part-Hawaiian women. The rates were similar in both samples, with slightly higher losses among all ethnic groups in the abortion sample.

The two samples show very similar rates of case loss for women

TABLE 11 Percentages of abortion and control samples estimated to be in state at end of 1980, by staff assignment and depreciation method, shown for selected variables

	Staff assignment			Depreciation		
Variable	Abortion	Control	Total	Abortion	Control	Total
Year of entry						
1970	63.34	72.25	67.78	64.67	74.33	69.83
1971	62.33	67.33	64.84	64.00	73.33	68.83
1972	66.34	66.78	66.55	68.33	70.67	69.83
1973	72.00	61.08	66.61	72.67	72.33	72.79
Place of birth						
Hawaii	81.34	89.38	85.31	79.67	87.67	83.61
Other U.S. state	49.37	32.94	41.73	53.67	51.31	52.71
Foreign	54.35	65.87	59.83	58.15	71.86	64.96
Unknown	42.86	53.92	52.04	52.38	62.75	61.79
Ethnicity						
Caucasian	48.54	41.37	45.31	65.63	67.26	66.25
Filipino	68.87	83.00	77.08	75.47	87.76	83.00
Hawaiian	81.32	82.69	82.09	87.35	90.38	89.04
Japanese/Chinese	84.56	91.09	87.20	87.58	93.56	90.00
Other	66.00	64.90	65.32	77.33	79.18	79.24
Age group						
< 20	64.49	65.44	64.84	67.39	72.22	69.18
20–24	63.46	60.48	61.88	64.32	69.37	65.58
25–29	60.32	71.88	67.00	63.89	75.36	70.52
30–34	83.21	77.56	80.28	79.56	80.95	79.93
34+	72.47	63.13	66.92	73.39	70.00	71.75

under 20 and over 29. The estimate shows a higher rate of case loss in the abortion sample for women in their 20s. This difference may partly reflect the estimation method's insensitivity to the large numbers of military dependents in the control sample, but some of the difference may be genuine.

The rate of retention of married women was virtually identical for the abortion and control samples. Women who were single at conception of the sampled event were more likely to remain in the state in the control sample, but less likely in the abortion sample. Separated,

TABLE 12 Estimated percentage of abortion and control samples in state to end of record-linkage period (1978), by place of birth, ethnicity, age, marital status, and year of entry into linkage

	Abortion		Control	
	N	%	N	%
Place of birth				
Hawaii	517	86.17	542	92.80
Other U.S. state	258	65.32	216	62.97
Foreign	128	69.57	134	80.24
Unknown	14	66.67	73	71.57
Ethnicity				
Caucasian	315	65.63	265	67.26
Hawaiian	145	87.35	188	90.38
Japanese/Chinese	261	87.58	189	93.56
Other	196	76.51	326	83.16
Age group				
<20	218	78.98	132	81.48
20–24	309	72.54	300	78.53
25–29	185	73.41	283	82.03
30–34	117	85.40	126	85.71
34+	87	79.82	124	77.50
Marital status				
Single	499	74.70	166	86.01
Married	312	79.39	716	80.63
Separated/divorced	104	75.36	13	81.25
Unknown	1	100.00	71	71.72
Year of entry				
1970	221	73.67	243	81.00
1971	217	72.33	242	80.67
1972	234	78.00	244	81.33
1973	244	81.33	239	79.67
Number of cases[a]	917		965	

[a] All numbers of cases were derived by rounding from weighted estimates.

divorced, and widowed women in the abortion sample were also less likely to have remained in the state.

In the control sample, there was no difference in the retention rate by year of entry in the record-linkage, but the abortion sample showed greater case loss among women who entered in the first two years. Again, some of the differential may be an artifact of the estimation procedure, but some of it may also reflect a genuine difference.

Overall, the demographic differences between the two estimated retained samples were not great. To a certain extent, the retention biases tended to reduce the known differences in the demographic composition of the original samples, making the retained samples more comparable. This observation is consistent with that of the part of the abortion cohort that had subsequent pregnancies, as discussed earlier. The two major factors of interest, age and ethnicity, were controlled for in the record-linkage data analyses. The results of the location analyses suggest that age and ethnicity controls are necessary not only because of the relation of these factors to the dependent variables in the analyses, but also because of the need to reduce the effect of possible retention bias between the two samples.

Analysis of variance was used to test whether women who left the state before the end of the record-linkage period differed significantly on a variety of fertility-related measures from those who remained. The results are shown in Table 13 for both samples and in Table 14 for the abortion sample alone.

The first analysis of variance (Table 13) provides two measures of retention bias. The first is whether there are any interaction effects involving location and sample, which would suggest a bias that might seriously affect the results of the comparison. There were no significant interactions involving location and either sample or ethnicity. The second measure is whether location has any direct or main effect; it had no significant effect on any of the dependent variables after adjustments were made for age, parity, ethnicity, and sample.

The results are the same when the in- and out-of-state groups are compared in the abortion sample alone. There were no significant effects of location, after adjustment for the effects of age, parity, and ethnicity (Table 14).

Although Table 13 shows no direct effect of location, there were significant differences between the abortion and control samples on all of the measures used except age at menarche. The same significant differences were found when the in- and out-of-state abortion samples were compared with the total control sample. Except for the two variables related to intercourse, however, the effects of all the variables on

TABLE 13 Analysis of variance showing relationship of location in or out of state to prior fetal loss, prior induced abortion, education, social class, age at menarche and at first intercourse, and frequency of intercourse

(Age and parity as covariates, ethnicity and sample as other factors)

Source of variation	Prior fetal loss	Prior induced abortion	Education	Social class	Age at menarche	Age at first intercourse	Frequency of intercourse
Covariates	0.01	0.01	0.01	0.01	0.05	0.01	*
Age	0.01	0.05	0.01	0.01	0.05	0.01	*
Parity prior to sampled event	*	*	0.01	0.01	*	0.01	*
Main effects	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Location	*	*	*	*	*	*	*
Sample	0.01	0.01	0.01	0.01	*	0.01	0.01
Ethnicity	*	*	0.01	0.01	0.01	0.01	*
Two-way interactions	*	*	*	0.05	*	*	*
Location X sample	*	*	*	*	*	*	*
Location X ethnicity	*	*	*	*	*	*	*
Sample X ethnicity	*	*	*	0.01	*	*	*
Three-way interactions	*	*	*	*	*	*	*
Location X sample X ethnicity	*	*	*	*	*	*	*
Number of cases	1,688	2,160	2,179	1,873	1,995	1,919	1,474

* Nonsignificant.

0.01 = Significant at 1% level.

0.05 = Significant at 5% level.

TABLE 14 Analysis of variance for abortion sample only showing relation of location in or out of state to selected variables
(Age and parity as covariates, ethnicity as additional factor)

Source of variation	Prior fetal loss	Prior induced abortion	Education	Social class	Age at menarche	Age at first intercourse	Frequency of intercourse
Covariates	0.01	0.01	0.01	0.01	0.01	0.01	*
Age	0.01	0.01	0.01	0.01	0.01	0.01	*
Parity	*	*	0.01	0.01	0.05	0.01	*
Main effects	*	*	0.05	0.01	0.01	0.01	*
Location	*	*	*	*	*	*	*
Ethnicity	*	*	0.01	0.01	0.01	0.01	*
Two-way interactions	*	*	*	*	*	*	*
Location X ethnicity	*	*	*	*	*	*	*
Number of cases	847	1,108	1,110	931	1,003	978	692

* Nonsignificant.

0.01 = Significant at 1% level.

0.05 = Significant at 5% level.

the outcome variables of interest to us in the comparisons between the abortion and control groups are allowed for by means of data stratification or logistic regression in the analysis of the main data to be presented. Furthermore, the importance of the intercourse variables on the major factors to be studied is questionable. Overall, the results of the analyses of retention bias strongly support the validity of the record-linkage data as a large and relatively unbiased subset of the original cohort of abortion cases. The changes that have occurred in the relationship of the abortion cohort to the two control samples appear to be minimal, and their confounding effects on the comparisons of the abortion and control samples can be allowed for by using appropriate controls in the data analysis.

Completeness of vital data reporting

A study of subsequent effects of induced abortion based on record-linked data assumes that the data base used is a complete record of relevant pregnancies, and that the record-linkage procedure is able to link each woman's available pregnancy records with accuracy and completeness. Incompleteness of the data base can arise in two ways. In the first, events of interest take place outside the confines of the reporting system; in the second, events that occurred within the limits of the reporting system fail to be reported. Two types of errors in the record-linkage procedure are failure of linkage and mismatch.

The design and method of analysis covering these aspects of the ancillary study are described in detail elsewhere (Chung et al., 1981). For analysis, the reproductive history reported by a respondent in the interview was compared, event by event, with that generated for her by the record-linkage. A weighting procedure was used to adjust the value of each case up or down from 1.0 to reflect the age and ethnic distribution of the retained sample for the record-linkage period.

In the abortion sample, 62.2 percent of women had at least one pregnancy after the sampled event, compared with 63.7 percent in the control sample. But there were gross differences in outcome types between the two samples. In the control sample, there were 81.6 percent births, 9.8 percent spontaneous abortions and pregnancy anomalies, and 8.6 percent induced abortions, whereas the corresponding rates for the abortion sample were 48.0 percent, 12.1 percent, and 39.9 percent, respectively. The higher rate of repeated induced abortions in the abortion sample and its implications have been discussed elsewhere (Steinhoff et al., 1979).

There are two kinds of incompleteness in reporting. One is the failure of a woman to report reproductive events in the interview that were previously recorded in the vital registration system. The other is the failure of the vital registration system to record known reproductive events. For the purpose of our study, based on the record-linkage, the second type is more serious. It is of interest that about a third of the women did not admit they had had a previous induced abortion, whereas no such omissions were observed for pregnancies ending in births. About 6 percent of spontaneous abortions were not reported by women. Women reported induced abortions as spontaneous abortions about as often as they made the reverse type of crossover. We have reported earlier, however, that vital statistics erroneously recorded 1.7 percent of induced abortions as spontaneous abortions (Chung et al., 1981). Among those induced and spontaneous abortions reported by women, dates of the events were recalled wrongly much of the time, though that discrepancy was negligible for births. Overall, the reporting of dates was quite accurate, the mean error being less than one week.

The vital statistics reporting system may miss events either because they took place outside the geographic area covered by the system, or because they occurred in the area but were not recorded. Although some degree of underreporting is to be expected in a vital statistics reporting system, either a large number of missing data on subsequent pregnancies or an unequal rate of underreporting in the abortion and control samples could call into question analyses based on the record-linked data.

To test for these potential biases, we compared all subsequent events reported by the women or by vital statistics ascertained through record-linkage, or both, for the 1970–78 period. We found some differences in completeness of reporting, by sample, as shown in Table 15. The differences were limited to the next pregnancy after the sampled event, as rates for pregnancies after the next event were nearly the same. In the abortion sample, 77.47 percent of next pregnancies were reported in vital statistics, compared with 91.23 percent of next pregnancies of controls. For all subsequent pregnancies combined, the figures were 79.50 percent and 87.53 percent, respectively. Within

TABLE 15 Pregnancies after sampled event, 1970–78, by sample, reporting status, and subsequent pregnancy order

	Next pregnancy				Pregnancies after next event				All subsequent pregnancies			
	Abortion		Control		Abortion		Control		Abortion		Control	
Reporting status	N	%	N	%	N	%	N	%	N	%	N	%
Reported in vital statistics[a]	136	77.47	216	91.23	85	83.26	107	80.75	221	79.50	323	87.53
Unreported												
Out of state	11	6.00	7	2.75	2	2.06	4	3.10	13	4.68	11	2.98
In state, unreported	29	16.53	14	6.01	15	14.69	21	16.15	44	15.83	35	9.49
All unreported	40	22.53	21	8.76	17	16.75	25	19.25	57	20.51	46	12.47
Number	176		237		102		132		278		369	

NOTE: Percentages based on weighted data.

[a] Includes events found in vital statistics after the woman reported them, but not previously linked.

both samples, however, roughly a third of the missing events occurred out of state, and two-thirds in the state.

Out-of-state events were presumably randomly distributed across pregnancy outcomes and occurred for reasons independent of the pregnancies themselves. Unreported in-state events, on the other hand, were strongly biased in favor of incomplete pregnancies, particularly induced abortions and uncomplicated early spontaneous abortions. Beginning in 1974, early induced abortions were no longer restricted to hospitals. Although state law requires reporting of all fetal deaths, regardless of gestation or cause, only events that require some use of hospital facilities are routinely reported. This factor, combined with the greater predilection of abortion recipients than of others to terminate their next pregnancy by induced abortion, accounts for much of the differential between the two samples.

If allowance were made for the known degree of underreporting of induced abortions by women, the differential would become even greater. As shown in Table 16 (adjusted induced abortion total), it increased to 73.91 percent versus 90.38 percent for next pregnancies.

Most analyses of the record-linked data were based on subsequent births and spontaneous abortions, with only indirect accounting for the disproportionate incidence of induced abortion. When the induced abortion cases are removed from the comparison, both samples are found to have had about the same proportions of unreported births and spontaneous abortions. The percentage of next events reported increases to 85.58 percent in the abortion sample and 91.74 percent in the control sample for next pregnancies (Table 16, total not reporting induced abortions). For the next eligible pregnancy–excluding induced abortions but taking the next birth after an induced abortion–the rates of reporting are again similar: 87.70 percent for the abortion sample and 91.56 percent for the controls.

Of particular importance for the study is the reporting of subsequent spontaneous abortions. In both samples, the rate of reporting spontaneous abortions varies with the method of determining the next event. Although the number of cases is rather small and the results must be interpreted with caution, there is no systematic evidence of differential reporting of subsequent spontaneous abortions in the abortion sample that could bias analyses based on the record-linked data in a particular direction. Rather, the results of the investigation of record-linkage error strengthen the study's finding of no difference between

TABLE 16 Reporting status of all pregnancies after sampled event, 1970–78, by pregnancy outcome and subsequent pregnancy order, with adjustment for women's underreporting of induced abortions

	Abortion				Control			
	In VS	Not in VS	Total	% reported	in VS	Not in VS	Total	% reported
Next pregnancy								
Induced abortion	48	25	73	65.86	16	4	20	79.85
Spontaneous abortion	10	10	20	49.06	13	11	23	55.95
Live birth	79	5	83	94.48	187	7	194	96.61
Total	136	40	176	77.47	216	21	237	91.23
Adjusted induced abortion	48	33	81	59.26	16	5	21	76.19
Adjusted total	136	48	184	73.91	216	23	239	90.38
Total not reporting induced abortions	89	15	104	85.58	200	18	218	91.74
Next eligible outcome								
Spontaneous abortion	13	10	23	56.52	13	12	25	52.00
Birth	94	5	99	94.95	193	7	200	96.50
Total	107	15	122	87.70	206	19	225	91.56

NOTE: Data include out-of-state pregnancies reported by women. All calculations are based on weighted data; consequently totals may vary because of rounding, and percentages may not correspond exactly to rounded numbers in cells.

VS—vital statistics.

the abortion and control samples in the rate of subsequent spontaneous abortion.

The number of cases of pregnancy anomalies such as ectopic pregnancy and hydatidiform mole (abnormalities of placenta with grape-like vesicles) was too small to evaluate in the same manner. Rates of reporting for live births differed slightly for next pregnancies but were identical for all subsequent pregnancies. Reporting rates for induced abortions were most dissimilar, but the adjusted rates for all subsequent pregnancies were very close. These comparisons again make it apparent that the overall differences in reporting were primarily due to the high incidence of repeat abortions of the next pregnancies of women in the abortion sample.

Completeness and accuracy of record-linkage

Even if the data base is adequate, the quality of the analysis depends upon the ability of the record-linkage procedure to match all events of the same woman (absence of linkage failures), and not to link together events that happened to different women (absence of mismatches). Our record-linkage procedure used several criteria to establish a correspondence between two vital statistics records. The primary match was made on a woman's maiden name, but her birthdate, ethnicity, and other characteristics such as married name were used to verify the match. Because of the many points of potential human error in the creation of the vital statistics records themselves, a certain margin of error had to be permitted for each criterion.

Mismatches. All true mismatches detected by the substudy were due to legal adoption. Hawaii law requires alteration of the birth certificate when a child is adopted. Consequently, a record-linkage procedure based primarily on the mother's maiden name will initially link the births of adopted children and any other pregnancies of the adopting mother.

Legal adoption actually causes two types of error: linking of the reproductive history of the adopting mother with a birth that she did not experience, and failure to link the reproductive history of the natural mother with that particular birth. This problem was identified during the sampling phase of the interview substudy, when the staff accidentally discovered indications of adoptions. Ten such cases were identified, and both women were included in the sample for location purposes. The study eventually located and interviewed four adopting

TABLE 17 Completeness of record linkage, by sample and pregnancy out-

	Next pregnancy						
	Abortion				Control		
Pregnancy outcome	Linked	Not linked	Total	% linked	Linked	Not linked	Total
Induced abortion	45	3	48	93.69	14	2	16
Spontaneous abortion	10	0	10	100.00	13	0	13
Birth	75	4	79	94.64	183	4	187
All outcomes	129	7	136	94.70	210	6	216

NOTE: Percentages calculated on weighted data: numbers rounded to whole numbers.

mothers and three natural mothers, but no matched pairs. All evidence relating to adoption linkages has been destroyed. In all cases, the woman reported the adoption in the interview; two of the three natural mothers reported the birth. For the purposes of evaluating record-linkage error, the adopting mothers were included in the sample and the natural mothers were excluded, since that pattern corresponds to the sample as drawn from vital statistics records. The four adoptions produced five mislinks to other pregnancies–three prior pregnancies and two subsequent. If the adoptions themselves are considered as mislinked events, then the rate of mislinkage in the control sample due to adoption is about 1 percent.

The three natural mothers who were located reported seven subsequent pregnancies. Two of these additional pregnancies were not recorded in vital statistics and therefore were not linkage failures. Because matched pairs were not available, it is not possible to calculate a precise estimate of the rate of failure to link owing to legal adoption. On the basis of this limited evidence, it might be assumed that failure to link occurs with at least the same frequency as mislinkage.

Linkage failure. If the record-linkage procedures were extremely accurate because they successfully rejected mislinks, they were likely also to have rejected or missed some true links. Cases of failure to link events of the same woman were identified when an event reported by a woman in the interview was subsequently found in the vital statistics records, even though it had not previously been linked.

The overall rates of successful linkage of the sampled event with all come for next pregnancy and all pregnancies except sampled event

	All pregnancies except sampled event							
	Abortion				Control			
% linked	Linked	Not linked	Total	% linked	Linked	Not linked	Total	% linked
86.90	86	6	92	93.48	25	2	27	92.59
100.00	16	1	17	94.12	38	0	38	100.00
97.99	183	11	194	94.33	355	5	360	98.61
97.27	285	18	303	94.06	418	7	425	98.35

prior and subsequent events recorded in vital statistics were slightly lower for the abortion sample than for the controls, 94.06 and 98.35 percent, respectively, as shown in Table 17. If allowance is made for the hidden linkage failures due to adoption, the difference decreases by at least 25 percent. The lowest rate of linkage in both samples was for induced abortions, where the two rates were 93.48 percent and 92.59 percent for the abortion and control samples, respectively. The differential between the two samples was caused primarily by the lower rate of successful linkage of births to women in the abortion sample. There was also a difference in successful linkage of spontaneous abortions, but the numbers were too small to affect the overall rates.

For all next-pregnancy outcomes, the rate of successful linkages was 94.7 percent in the abortion sample and 97.27 percent in the control sample. If the hidden failures due to adoption are considered, the rates were probably extremely close.

Causes of linkage failure. Although the primary record-linkage was based on the woman's maiden name, in some cases the record for a particular event contained only a married name. The marriage and divorce records of 1970–78 were cross-checked, but not all changes of marital status happened in the state, and not all of those that did were caught in the hand-checking process. In addition, names were often spelled differently or recorded differently, and initials were sometimes used. Many variations were caught by extensive hand-cleaning of the record-linkage, but inevitably some were missed. In other cases, the link was rejected because not enough supporting information matched to override the discrepancy.

Changes of name, or the recording of events under different name combinations, accounted for 80 percent of the linkage failures in the abortion sample. Most of the remainder were technical failures such as rejection for lack of supporting data, or absence of a critical intermediate link as in the case of reported neonatal death without the corresponding report of birth. There was only one failed linkage for no apparent reason.

In the control sample, about a third of the records failed to link because of name changes. The remainder were not linked because of spelling variations. The control linkage was not hand-cleaned as completely as the abortion linkage. Had the control linkage been cleaned as carefully, some spelling discrepancies would have been caught and either accepted or rejected on the basis of supporting data.

Misclassification of control subjects

Virtually every type of error in the data base or the record-linkage procedure could result in the misclassification of a woman with a prior induced abortion as a control subject, although all individuals linked with the original abortion cohort and the subsequent registry of elective abortions of the State Health Department were excluded from the control sample.

Limitations in the quality of the data base used for the record-linkage accounted for nearly all of the misclassified cases in the record-linked control sample. Aside from one unrecorded in-state abortion within the record-linkage period, all of these errors were induced abortions that occurred prior to the beginning of the record-linkage period.

Record-linkage errors proved to be a minor problem for the linked control sample. We detected no failures to link a woman in the control sample to a prior induced abortion that was recorded in vital statistics.

Although the potential sources of misclassification error are myriad, the control sample appears to have been relatively uncontaminated. In the record-linked control sample, only 3.0 percent of the women were probably misclassified.

Control-sample contamination of this magnitude is unlikely to have biased the results of the main record-linkage study. The adverse outcomes being studied are relatively rare events and the differences found between the samples minimal.

Confounding variables

Some of the variables of interest to us as indicators of subsequent pregnancy risk (spontaneous abortion, low birth weight, short gestation, and congenital malformations) are also known to be affected by other factors, such as maternal smoking, alcohol consumption, and diabetes. Since the main study does not consider these factors in the analysis, an independent check of possible association of these factors with induced abortion was needed for interpreting the results of the main study. The interview substudy investigated the possibility that such factors might confound the relationship between induced abortion and these indicators of risk in subsequent pregnancies. For this purpose we compared the frequency of these attributes in the abortion and control samples.

Cases used for the analysis included all subsequent pregnancies in the abortion and control interview samples described earlier and in the special supplemental sample drawn from the pool of induced abortion cases that had already been linked to subsequent pregnancies in the vital statistics records. (The supplemental sample was added to ensure that sufficient cases of subsequent pregnancies of women with an abortion history would be available for analyses such as the present one. Location and interviewing procedures were the same as for the other samples.) The two samples were similar in size (490 pregnancies in the abortion sample and 406 in the control sample).

Interview respondents were asked about the amount of cigarette, cigar, and pipe smoking they had done, and the frequency and amount of their alcohol consumption during each trimester of every pregnancy. They were also asked whether they were diabetic, and if so, the age at onset and type of treatment they received. From these data, it was possible to identify the type of diabetes and specify at which pregnancies a woman was either diabetic or prediabetic.

Smoking. The proportion of women who smoked during subsequent pregnancies was low overall but differed by ethnic group. It ranged from a low of 20 percent among Japanese and Chinese women to a high of 40 percent among Hawaiian and part-Hawaiian women. Smoking was more common among women under 25, and decreased sharply thereafter. Only three women reported smoking cigars or pipes, and two of those also smoked cigarettes. (Marijuana smoking is not included in this analysis, because the research literature that prompted the investigation is limited to tobacco smoking, and the assumption is that the observed effects are due in large part to nicotine.)

There were no significant differences between the abortion and control samples in the proportion of women who smoked, except for the Hawaiian group, in which the abortion sample smoked more. When only next pregnancies after the sampled event were considered, this difference was not significant. We conclude that the difference was an artifact caused by the higher subsequent pregnancy rate of young Hawaiian women with a history of induced abortion. We expected age-associated confounding to be removed in the main study by stratification or multivariate analysis.

Drinking. The proportion of women who consumed alcohol during subsequent pregnancies also varied by ethnic group. It ranged from a low of 15 percent among Japanese and Chinese women to a high of 50 percent among Caucasian women. Heavy drinking (more than an estimated 80 ounces of alcohol per trimester) was found among less than 3 percent of the sample, and the numbers were too small for detailed statistical analysis. The proportion of women who consumed alcohol increased with age, but heavy drinkers were broadly distributed across age and ethnic categories. Women reported slightly less drinking in each successive trimester. There were no significant differences in drinking patterns between the abortion and control samples in any trimester of pregnancy.

Diabetes. No significant difference emerged between samples in the incidence of diabetes in subsequent pregnancies. In the next pregnancy, 4.36 percent of women in the abortion sample had diabetes, compared with 4.17 percent of women in the control sample. Rates were essentially the same at each successive pregnancy. Hawaiian and part-Hawaiian women had higher rates of adult onset and gestational diabetes in both samples. These two types of diabetes accounted for over 95 percent of all diabetes-affected pregnancies.

In sum, there is no reason to suspect that differential rates of smoking, alcohol consumption, or diabetes confounded the comparisons between the abortion and control samples in subsequent spontaneous abortion, birthweight, gestation length, or congenital anomalies.

METHODS OF ANALYSIS

Given the basic aims of the study, it was highly desirable that the data be subjected to a uniform statistical treatment. The nature of our data would not allow such a convenient treatment, however. Various factors had to be considered in determining the appropriate methods of analysis. First, information in fetal death certificates, especially about early fetal deaths, was much less complete than that in birth certificates. For example, reproductive histories of women were missing altogether from certificates of fetal death that occurred less than 16 weeks after conception. Second, most of the pregnancy outcomes of interest in our study were represented by indicator variables such as low birth weight, presence of pregnancy complications, or spontaneous abortion, whereas such a variable as birth weight itself could be considered as a continuously distributed variable. Third, we had to allow for confounding variables in the analysis. Adjustment for these confounders presents no special analytical problem for a continuously distributed trait because the multiple regression method should serve as an adequate tool for covariance analysis. But the adjustment becomes increasingly difficult with indicator variables as the number of confounding factors increases (Miettinen, 1976).

Aside from coping with the specific problems described above, on general principle methods of analysis must possess sufficient intelligibility so that the result can be understood readily by a large number of readers and retained with a reasonable degree of statistical efficiency. For this reason, we chose the following strategy for analyzing the data.

Two sources of data necessarily call for different approaches. Vital records constituted the major source of data for our study, in which no matching of extraneous variables took place. The hospital data provided more refined information and were based on a matched-pair design. To analyze the data from vital records, we used the following stepwise procedures. For discrete outcome variables, the first step consisted of a simple χ^2 analysis using the Mantel-Haenszel (1959) method. Stratification of the data was based on racial group, maternal age at the time of event (subsequent event for the abortion cohort), and parity (number of prior live births). The samples consisted of five racial groups, four age groups, and two parity groups, giving rise to $5 \times 4 \times 2 = 40$ strata for the analysis. The Mantel-Haenszel method is a technique for analyzing a combination of 2 × 2 contingency tables, each of which is composed of:

	Prior abortion	No prior abortion	
Positive outcome	A_i	B_i	N_{1i}
Negative outcome	C_i	D_i	N_{2i}
	M_{1i}	M_{2i}	T_i

where A_i, B_i, C_i, and D_i are the observed numbers in the respective cells in the ith stratum with the marginal totals of N_{1i}, N_{2i}, M_{1i}, and M_{2i} and $T_i = A_i + B_i + C_i + D_i$. The overall test of the null hypothesis of no association is given by $\chi^2 = (|\Sigma A_i - \Sigma E(A_i)| - \frac{1}{2})^2 / \Sigma V(A_i)$ with one degree of freedom, where $E(A_i) = N_{1i}M_{1i}/T$ and $V(A_i) = N_{1i}N_{2i}M_{1i}M_{2i}/ T_i^2(T_i - 1)$. The overall relative risk may be estimated by $\psi = \Sigma(A_iD_i/ T_i)/\Sigma(B_iC_i/T_i)$.

The method provides a powerful test of the null hypothesis, with a single degree of freedom allowing for a small number of important confounding variables. Furthermore, it can be readily understood and the result can be directly related to a given table. But the procedure does not allow for other possible confounding variables. Therefore, we did not take rejection (or acceptance) of the null hypothesis, based on the preceding test, as final unless it was supported by further tests.

Parity grouping for the comparison presents an interesting problem. Nulliparous women from the abortion group who had a subsequent pregnancy could be contrasted to nulliparous control women or to control women with parity 1, depending on whether an induced abortion was viewed as a live birth or not. To accommodate the alternative interpretations of induced abortion, we did two parity groupings in forming strata. In the first case, the abortion and control samples were compared within parity classes of 0 or 1 or more parity, whereas in the second case, nulliparous abortion women were contrasted to parity 1 control women, and parity 1 or more abortion women contrasted to parity 2 or more control women.

The χ^2 analysis was followed by multivariate logistic regression analysis (Truett et al., 1967) that included other possible confounding variables in addition to the variables considered above. According to the method, the probability of having a positive outcome can be expressed as $\frac{1}{1 + e^{-(a+\Sigma\beta_i x_i)}}$, where e, a, and β_i are respectively the base of the natural logarithm, a constant, and the coefficient of the ith variable influencing the risk of positive outcome of the variable under study. The variables (x_i) include the exposure and confounding variables. The β_i represents also the coefficient of the linear discriminant function discriminating between the groups of positive and negative outcomes. Under this model, the independent effect of induced abortion can be tested by the significance of β_I, corresponding to history of induced abortion. Furthermore, as history of induced abortion was coded as 1 for positive and 0 for negative, e^{β_I} becomes an estimate of relative risk for the abortion women, allowing for the confounding variables. Other variables considered were year of pregnancy outcome, maternal age, race coded by four binary variables taking Caucasians as the base, resident island (Oahu = 1, otherwise = 0), pregnancy order of event, marital status of the mother at the time of the outcome (married = 0, not married now = 1), and mother's education in years.

Methods analyzing birth weight, gestation length, fetal death, and ectopic pregnancy deviated from the procedure discussed earlier. We analyzed birth weight and gestation length, represented as continuous variables, by the multiple regression method by introducing a number of dummy variables, to be discussed below. For fetal death, we substituted marital status for parity in the Mantel-Haenszel χ^2 analysis because information on the latter was missing from early fetal death records. For the χ^2 analysis of ectopic pregnancy, maternal race was not considered because of the limited number of cases in the abortion group; therefore, there were only eight strata (4 age groups × 2 marital groups) for the analysis.

More elaborate analyses were performed on the matched hospital data because of higher quality and limited sample size of the data. They were done in several stages. At the initial stage, we compared the abortion and control groups by means of McNemar's χ^2 test (Fleiss, 1973) applicable to matched data. Next we analyzed the matched data by multivariate logistic regression, as was done for the vital registration data. Mother's education was not included in the logistic model, however.

We further studied possible abortion effects by making comparisons between specific subgroups of the abortion and control groups selected on the basis of reproductive history of the women, with due allowance for the matched variables. This analysis included comparisons of pregnancy outcome of the nulliparous cohort women who had had only one previous induced abortion with the control pregnancies of three groups: women who had had no prior pregnancy, those who had had only one prior spontaneous abortion, and those who had experienced only one prior live birth. These comparisons were of special importance because the majority of women who elect abortion have only one and these control subgroups provide a meaningful base for comparison with the cohort women.

We studied factors associated with induced abortion at the time of procedure in relation to pregnancy outcome by comparing subgroups of the abortion group with the control, stratifying by multivariate confounder scores proposed by Miettinen (1976). Essentially, this method enables a comparison of the two groups with adjustment for confounding variables. For this purpose, we transformed the computed linear discriminant function for a particular outcome, described earlier, to the scoring function by fixing the exposure variable (prior abortion history) at the level of control (no abortion history). Thus the confounder scores were "standardized" at the level of subjects with no history of induced abortion. The score was computed for each subject and these scores served as a basis for constructing five strata so that each stratum had approximately an equal number of subjects with a history of induced abortion. Finally, we computed relative risk for each stratum and carried out the overall test of association using the Mantel-Haenszel χ^2 method.

The confounder variables considered were the same ones included in the multivariate logistic regression analysis for the hospital data. Factors studied in relation to abortion were maternal age and gestation weeks at the time of procedure, number of previous induced abortions experienced, type of procedure, use of laminaria, and abortion complications. Maternal age was age at first induced abortion if there were more than one. Other factors pertained to the most recent induced abortion. Abortion complications were coded as present if one or more of the following conditions were observed after the previous termination of pregnancy: hemorrhage of 300 cc. or more, uterine perforation, adverse reaction to oxytocin or anesthesia, cervical laceration, retained secundines, and failed abortion with first procedure.

FINDINGS

Spontaneous fetal loss

For the analysis, spontaneous fetal loss was classified into three types on the basis of completed gestation length: first-trimester ($\leqslant$ 14 weeks), second-trimester (15–27 weeks), and third-trimester ($\geqslant$ 28 weeks) losses. We first present the results separately for the three types and then discuss them together. All of major Mantel-Haenszel χ^2 analyses of the main body of data were based on 40 strata (five racial groups, four age intervals, and two marital status classes), although the tables shown were stratified only by age and marital status for ease of presentation.

First-trimester Spontaneous Fetal Loss

Table 18 shows first-trimester abortions of the two samples stratified by maternal age and marital status at the time of outcome. There were 3,764 and 93,857 valid observations for the abortion and control samples, respectively. Of these, the respective proportions of first-trimester fetal loss were 6.85 and 6.17 percent. As tested by the Mantel-Haenszel χ^2, the difference was not significant ($\chi^2 = 1.11$, $P = 0.29$), the estimated relative risk being 1.08. The relative risk estimated directly from the data (0.0685/0.0617) was 1.11.

Because of apparent differences between married and unmarried women in the degree of association between abortion history and first-trimester fetal loss, we analyzed the data separately for the two groups. For married women there was no difference between the abortion and control groups, the loss rate being 5.06 and 5.75 percent, respectively ($\chi^2 = 0.26$, $P = 0.61$, relative risk = 0.95). The situation was quite different, however, for unmarried women; the abortion group had a significantly higher risk of first-trimester loss as indicated by the rates of 13.52 percent and 8.51 percent ($\chi^2_1 = 6.90$, $P = 0.009$, relative risk = 1.34).

TABLE 18 First-trimester spontaneous fetal loss of subsequent pregnancies of abortion and control groups, by age and marital status

Age group and marital status	Abortion				Control			
	Fetal loss	No fetal loss	Total	Proportion	Fetal loss	No fetal loss	Total	Proportion
< 20								
Unmarried	18	180	198	0.0909	403	5,979	6,382	0.0631
Married	6	266	272	0.0221	339	8,987	9,326	0.0363
20–24								
Unmarried	48	290	338	0.1420	450	4,288	4,738	0.0950
Married	46	1,061	1,107	0.0416	1,321	26,662	27,983	0.0472
25–29								
Unmarried	28	146	174	0.1609	192	1,751	1,943	0.0988
Married	40	1,012	1,052	0.0380	1,399	24,083	25,482	0.0549
> 29								
Unmarried	14	75	89	0.1573	172	1,067	1,239	0.1388
Married	58	476	534	0.1086	1,516	15,248	16,764	0.0904
Total	258	3,506	3,764	0.0685	5,792	88,065	93,857	0.0617

$\chi^2_1 = 1.11$.

$P = 0.29$.

Relative risk = 1.08.

TABLE 19 Estimated coefficients of multivariate logistic function and significance test for first-trimester fetal loss: all vital data

Variable	Coefficient	Standard error	z
Constant	-4.023		
Year of outcome	-0.015	0.006	-2.65*
Woman's age	0.076	0.003	30.00†
Race			
Hawaiian or part-Hawaiian	-0.519	0.038	-13.53†
Filipino	-0.390	0.039	-9.95†
Oriental	-0.375	0.037	-10.16†
Other	-0.431	0.052	-8.32†
Resident island	0.504	0.035	14.29†
Current marital status	0.944	0.039	24.42†
History of induced abortion	0.102	0.068	1.49

Relative risk = $e^{0.102}$ = 1.11.

* Significant at 0.01 level.

† Significant at 0.001 level.

Table 19 shows the result of the logistic regression analysis. It is of interest to note that every covariate included in the model was significantly associated with the risk of first-trimester fetal loss. With all of the covariates allowed for, history of induced abortion showed no significant relationship with the risk of early fetal death. The relative risk estimated from the regression was 1.11 ($z = 1.49$, $P = 0.14$), which is in close agreement with the preceding estimate based on the stratified data.

The preceding analysis adjusts for only race, maternal age, and marital status, and most of the information was derived from vital registration records. An important variable not considered in the analysis is parity or pregnancy order because of incompleteness of such information in fetal death records reported to the Health Department. Therefore, further analysis of refined data assumes special importance for spontaneous fetal death. Our study based on the hospital data is fully described elsewhere (Chung et al., 1982a). The abortion and control samples were pair-matched by race, age, and time of pregnancy out-

TABLE 20 Comparisons of spontaneous loss rates from matched

Spontaneous losses by trimester	Abortion +, control +	Abortion +, control −	Abortion −, control +	Abortion −, control −
First	19	212	165	3,020
Second	1	75	77	3,263
Third	0	16	21	3,379

* Significant at 0.025 level.

a. Confidence limits (CL) 95%.

come (± one month) in those data. Table 20 shows the distribution of four combinations of outcome between the abortion and control samples, where a plus sign indicates the presence of first-trimester fetal loss and a minus sign the absence of the outcome. The association of fetal loss with history of induced abortion was significant as tested by McNemar's χ^2 method ($\chi^2_1 = 5.61$, $P = 0.02$). The associated odds ratio was 212/165 = 1.28 and the relative risk 1.26. But the increase in the estimated relative risk over that of the main body of data was due largely to a lower rate of fetal loss in the control group as indicated by 6.8 versus 5.4 percent for the abortion and control samples, respectively (Table 20), whereas the corresponding rates from the main body of data were 6.9 and 6.2 percent, respectively (Table 18). The discrepancy in the controls was probably due to a difference in the mean parity.

The result of logistic function analysis of first-trimester fetal loss for the hospital data is shown in Table 21. The model includes residence island, pregnancy order of the event, and current marital status of the mother in addition to the three matched variables of year of the event, maternal age, and race. When all of the covariates were allowed for, history of induced abortion showed no significant association with early fetal death. The estimated relative risk for the abortion cohort was 1.10, which was nearly identical to that estimated from the logistic regression of the unmatched main body of data.

Table 22 shows the matched comparisons of spontaneous fetal loss rates for pregnancies of women with a history of only one induced abortion (A1) with the three subgroups of control pregnancies: those preceded by only one spontaneous abortion (S1), only one live birth (P1), and no previous live birth (P0). In these comparisons, the origihospital data

Total number of pairs	X^2_1	Odds ratio and CL[a]	Proportion in abortion group	Proportion in control group	Relative risk
3,416	5.61*	1.28(1.02-1.55)	0.068	0.054	1.26
3,416	0.01	0.97(0.66-1.28)	0.022	0.023	0.97
3,416	0.43	0.76(0.27-1.26)	0.005	0.006	0.76

nally matched variables remained matched, resulting in considerable reduction in sample sizes. Thus the data for the A1 and S1 groups were too small for a valid comparison. None of the comparisons between the A1 and P1 groups or between the A1 and P0 groups showed significant differences in their rates. The estimated relative risks for

TABLE 21 Estimated coefficients of multivariate logistic function and significance test for spontaneous first-trimester fetal loss: hospital data

Variable	Coefficient	Standard error	z
Constant	2.083		
Year of outcome	-0.093	0.037	-2.49*
Woman's age	0.071	0.013	5.49†
Race			
Hawaiian or part-Hawaiian	-0.452	0.147	-3.07†
Filipino	-0.161	0.164	-0.98
Oriental	0.054	0.143	0.38
Other	-0.430	0.228	-1.88
Resident island	0.006	0.139	0.04
Pregnancy order	0.044	0.038	1.18
Current marital status	1.207	0.147	8.23†
History of induced abortion	0.094	0.107	0.88

Relative risk = $e^{.094}$ = 1.10.

* Significant at 0.05 level.

† Significant at 0.01 level.

TABLE 22 Matched-pair comparisons of spontaneous fetal loss (+) and relative risks (RR) for specific combinations of reproductive history

Matched pairs	First-trimester	Second-trimester	Third-trimester
Abortion cohort			
A1			
+	1	0	0
–	39	40	40
Total	40	40	40
p	0.0250	0	0
Control			
S1			
+	3	1	0
–	37	39	40
Total	40	40	40
p	0.0750	0.0250	0
X^2_1	0.25	0	
RR ± S.E.	0.33±0.38		
Abortion cohort			
A1			
+	15	4	1
–	318	329	332
Total	333	333	333
p	0.0450	0.0120	.0030
Control			
P1			
+	15	5	0
–	318	328	333
Total	333	333	333
p	0.0450	0.0150	0
X^2_1	0.04	0	
RR ± S.E.	1.00±0.39	0.80±0.54	
Abortion cohort			
A1			
+	34	13	1
–	500	521	533
Total	534	534	534
p	0.0637	0.0243	.0019
Control			
P0			
+	27	18	4
–	507	516	530
Total	534	534	534
p	0.0506	0.0337	.0075
X^2_1	0.65	0.52	0.80
RR ± S.E.	1.29±0.35	0.72±0.26	0.25±0.28

first-trimester fetal loss accompanied by large standard errors were 1.00 (C.L. 0.23 and 1.77) and 1.29 (C.L. 0.60 and 1.98) for the A1 versus P1 and A1 versus P0 comparisons, respectively.

The results of testing specific factors associated with the most recent induced abortion are summarized in Table 23, which shows relative risk (RR) based on the Mantel-Haenszel method as applied to the data stratified by the multivariate confounder scores. The scores were derived from the discriminant function shown in Table 21. The data were grouped into five strata. Each subgroup of the cohort pregnancies characterized by a factor at previous induced abortion (e.g., use or non-

TABLE 23 Adjusted relative risks for first-trimester spontaneous fetal loss associated with previous induced abortion (IA) factors

Factors	Relative risk	$X^2{}_1$
Age at first IA		
< 20	0.95	0.06
20–24	1.30	3.79
25–29	1.01	0.004
> 29	1.62	3.59
Number of IAs		
1	1.15	1.56
> 1	1.01	0.003
Gestation weeks at last IA		
< 9	1.40	6.83†
9–12	0.93	0.23
> 12	1.03	0.004
IA procedure		
D&C	0.97	0.0006
Suction	1.06	0.14
Saline	0.90	0.06
D&C + suction	1.33	3.98*
Use of laminaria		
No	1.14	1.16
Yes	1.10	0.29
Abortion complications		
No	1.15	1.56
Yes	0.92	0.02

* Significant at 0.05 level.

† Significant at 0.01 level.

use of laminaria) was compared with the entire control group, comprising 3,416 observations, to test the association with one degree of freedom. Among six factors characterizing induced abortion—age at first induced abortion, number of previous induced abortions, gestation length at time of procedure, abortion procedure, use of laminaria, and abortion complications—we detected significant associations between the risk of first-trimester spontaneous abortion and both use of D&C + suction as the abortion procedure and short gestation length at time of induced abortion (< 9 weeks). The respective relative risks were 1.33 ($\chi^2_1 = 3.98$, $P = 0.046$) and 1.40 ($\chi^2_1 = 6.83$, $P = 0.009$). The D&C + suction procedure consisted of suction followed by sharp curettage and was practiced more commonly in the early years after the legalization of induced abortion.

Given the suggested association between the risk of early fetal loss and both abortion method and gestation stage at the time of induced abortion, we decided to check the consistency of the association and allow for separation of the effects of confounding variables. Because of the controversy involved, use of laminaria and number of prior induced abortions were also investigated further.

Table 24 shows the unadjusted rates of fetal loss during the first trimester by method of abortion procedure. The upper panel pertains to second pregnancies of women whose only previous pregnancies

TABLE 24 First-trimester spontaneous fetal loss (SA), by method of previous abortion procedure

Type of data and SA or no SA	D&C	Suction	D&C + suction	Other	Total
Only prior pregnancy terminated by induced abortion, 1971–76					
SA	11	34	41	12	98
No SA	208	673	484	189	1,554
Total	219	707	525	201	1,652
p	0.0502	0.0481	0.0781	0.0597	0.0593
All subsequent pregnancies, 1971–78					
SA	63	151	152	35	401
No SA	713	1,972	1,862	490	5,037
Total	776	2,123	2,014	525	5,438
p	0.0812	0.0711	0.0755	0.0667	0.0737

were terminated artificially; the analysis thereby removes possible complicating factors associated with other previous pregnancies. The highest frequency of first-trimester fetal loss (0.0781) was among women who had had the D&C + suction procedure ($\chi^2_1 = 4.87$, $P = 0.03$), and there was no evidence of heterogeneity among other procedures ($\chi^2_2 = 0.41$, $P = 0.52$). The association disappeared, however, when the sample size was increased to include all repeated pregnancies for the study period as shown in the lower panel of Table 24 ($\chi^2_3 = 1.59$, $P = 0.21$).

Table 25 shows the relationship of completed gestation weeks at time of last induced abortion with first-trimester spontaneous loss. This subset of data again corroborates the earlier finding of a significant association of gestation time with early fetal loss ($\chi^2_1 = 9.36$, $P = 0.002$). Pregnancies occurring after induced abortion performed at less than nine completed weeks of gestation had about a 55 percent greater risk of first-trimester spontaneous abortion (RR = 1.55) than pregnancies preceded by induced abortion performed at a later stage of pregnancy. The trend persisted in all subsequent pregnancies during 1971–78; the χ^2 value was 10.33 ($P = 0.001$) and the relative risk 1.43, when "other" types of procedure were excluded from the analysis (Table 26).

Table 27 compares the rates of spontaneous fetal loss during the first trimester between pregnancies of the cohort women whose last induced abortions were accompanied by laminaria for cervical dilation and another group in which laminaria was not employed. Although the risk of pregnancy loss tended to be higher for the pregnancies following induced abortion in which no laminaria was used, none of the associations proved to be significant ($\chi^2_1 = 0.40$, $P = 0.53$); the overall relative risk was 1.12.

We also compared the rates of early fetal loss in a group of pregnancies preceded by only one previous induced abortion and another preceded by two or more induced abortions among women who had had two or more previous pregnancies (Table 28). No significant differences were detected in fetal loss rates between the two groups. The significance of these findings will be discussed in the concluding part of this section.

TABLE 25 First- and second-trimester spontaneous fetal loss (SA), by pregnancy order, number of gestation weeks at previous induced abortion, and abortion procedure

Trimester, pregnancy order, and abortion procedure	< 9 weeks				⩾9 weeks			
	SA	No SA	Total	Prop.	SA	No SA	Total	Prop.
First trimester								
Second pregnancy								
D&C	6	92	98	.0612	5	116	121	.0413
Suction	20	303	323	.0619	14	371	385	.0364
D&C + suction	20	218	238	.0840	21	266	287	.0732
Third or later pregnancy								
D&C	6	134	140	.0429	12	138	150	.0800
Suction	37	304	341	.1085	20	381	401	.0499
D&C + suction	32	285	317	.1009	23	358	381	.0604
Total	121	1,336	1,457	.0830	95	1,630	1,725	.0551
Second trimester								
Second pregnancy								
D&C	0	98	98	0	3	118	121	.0248
Suction	11	312	323	.0341	6	379	385	.0156
D&C + suction	0	238	238	0	7	280	287	.0244
Third or later pregnancy								
D&C	8	132	140	.0571	7	143	150	.0467
Suction	10	331	341	.0293	5	396	401	.0125
D&C + suction	3	314	317	.0095	14	367	381	.0367
Total	32	1,425	1,457	.0220	42	1,683	1,725	.0243

TABLE 26 First- and second-trimester spontaneous fetal loss (SA), all subsequent pregnancies during 1971–78, by number of gestation weeks at previous induced abortion and abortion procedure

Trimester and abortion procedure	<9 weeks				⩾9 weeks			
	SA	No SA	Total	Prop.	SA	No SA	Total	Prop.
First trimester								
D&C	29	332	361	0.0803	34	381	415	0.0819
Suction	90	906	996	0.0904	61	1,066	1,127	0.0541
D&C + suction	81	844	925	0.0876	71	1,017	1,088	0.0653
Other	0	2	2	0	35	488	523	0.0669
All methods	200	2,084	2,284	0.0876	201	2,952	3,153	0.0637
Second trimester								
D&C	11	350	361	0.0305	8	407	415	0.0193
Suction	26	970	996	0.0261	15	1,112	1,127	0.0133
D&C + suction	15	910	925	0.0162	26	1,062	1,088	0.0239
Other	0	2	2	0	3	520	523	0.0057
All methods	52	2,232	2,284	0.0228	52	3,101	3,153	0.0165

TABLE 27 First- and second-trimester spontaneous fetal loss (SA), abortion, and abortion procedure

Trimester, pregnancy order, and abortion procedure	Abortion cohort			
	No laminaria			
	SA	No SA	Total	Prop.
First trimester				
Second pregnancy				
D&C	10	185	195	0.0513
Suction	26	457	483	0.0538
D&C + suction	29	317	346	0.0838
Other	11	144	155	0.0710
Third or later pregnancy				
D&C	17	253	270	0.0630
Suction	43	509	552	0.0779
D&C + suction	37	474	511	0.0724
Other	5	76	81	0.0617
Total	178	2,415	2,593	0.0686
Second trimester				
Second pregnancy				
D&C	3	192	195	0.0154
Suction	13	470	483	0.0269
D&C + suction	5	341	346	0.0145
Other	0	155	155	0
Third or later pregnancy				
D&C	14	256	270	0.0519
Suction	13	539	552	0.0236
D&C + suction	12	499	511	0.0235
Other	1	80	81	0.0123
Total	61	2,532	2,593	0.0235

Second-trimester Fetal Loss

Table 29 shows the second-trimester fetal loss rates for the abortion and control groups of the main study as stratified by maternal age and marital status. In contrast to our observations of first-trimester spontaneous loss, we found abortion and control groups in this case to be markedly similar, with the overall rates of 1.70 percent and 1.77 per-by pregnancy order, use of laminaria during previous induced

Laminaria				Control			
SA	No SA	Total	Prop.	SA	No SA	Total	Prop.
1	23	24	0.0417	53	1,025	1,078	.0492
8	216	224	0.0357				
12	167	179	0.0670				
1	45	46	0.0217				
1	19	20	0.0500	74	1,017	1,091	.0678
14	177	191	0.0733				
18	170	188	0.0957				
3	51	54	0.0556				
58	868	926	0.0626	127	2,042	2,169	.0586
0	24	24	0	12	1,066	1,078	.0111
4	220	224	0.0179				
2	177	179	0.0112				
1	45	46	0.0217				
1	19	20	0.0500	30	1,061	1,091	.0275
2	189	191	0.0105				
5	183	188	0.0266				
2	52	54	0.0370				
17	909	926	0.0184	42	2,127	2,169	.0194

cent, respectively ($\chi^2_1 = 0.03$, $P = 0.86$), the relative risk being 0.97. Furthermore, we could discern no difference between pregnancies of married and unmarried women when we analyzed them separately; $\chi^2_1 = 0.002$ and relative risk = 1.00 for the married and $\chi^2_1 = 0.11$ and relative risk = 0.90 for the unmarried group. This finding was clearly supported by the result of the logistic regression analysis, which produced an identical relative risk estimate (Table 30).

TABLE 28 First- and second-trimester spontaneous fetal loss (SA), by previous abortion procedure and number of previous induced abortions

Trimester and previous abortion procedure	One previous abortion				Two or more previous abortions			
	SA	No SA	Total	Prop.	SA	No SA	Total	Prop.
First trimester								
D&C	15	229	244	0.0615	3	40	43	0.0698
Suction	46	556	602	0.0764	9	115	124	0.0726
D&C + suction	43	463	506	0.0850	11	159	170	0.0647
Other	5	92	97	0.0515	3	34	37	0.0811
All methods	109	1,340	1,449	0.0752	26	348	374	0.0695
Second trimester								
D&C	13	231	244	0.0533	2	41	43	0.0465
Suction	12	590	602	0.0199	3	121	124	0.0242
D&C + suction	13	493	506	0.0257	3	167	170	0.0176
Other	2	95	97	0.0206	1	36	37	0.0270
All methods	40	1,409	1,449	0.0276	9	365	374	0.0241

TABLE 29 Second-trimester spontaneous fetal loss among abortion and control groups, by age and marital status

Age group and marital status	Abortion				Control			
	Fetal loss	No fetal loss	Total	Prop.	Fetal loss	No fetal loss	Total	Prop.
< 20								
Unmarried	5	193	198	0.0253	161	6,221	6,382	0.0252
Married	5	267	272	0.0184	123	9,203	9,326	0.0132
20–24								
Unmarried	7	331	338	0.0207	123	4,615	4,738	0.0260
Married	15	1,092	1,107	0.0136	389	27,594	27,983	0.0139
25–29								
Unmarried	3	171	174	0.0172	34	1,909	1,943	0.0175
Married	13	1,039	1,052	0.0124	399	25,083	25,482	0.0157
> 29								
Unmarried	3	86	89	0.0337	44	1,195	1,239	0.0355
Married	13	521	534	0.0243	392	16,372	16,764	0.0234
Total	64	3,700	3,764	0.0170	1,665	92,192	93,857	0.0177

$\chi^2_1 = 0.03$.

$P = 0.86$.

Relative risk = 0.97.

TABLE 30 Estimated coefficients of multivariate logistic function and significance test for second-trimester fetal loss: all vital data

Variable	Coefficient	Standard error	z
Constant	-4.489		
Year of outcome	-0.047	0.011	-4.43†
Woman's age	0.043	0.005	9.12†
Race			
Hawaiian or part-Hawaiian	-0.180	0.071	-2.53*
Filipino	-0.328	0.073	-4.51†
Oriental	-0.252	0.069	-3.67†
Other	-0.226	0.096	-2.35*
Resident island	0.339	0.065	5.18†
Current marital status	0.718	0.072	10.03†
History of induced abortion	-0.033	0.126	-0.26

Relative risk = $e^{-0.033} = 0.97$.

* Significant at 0.05 level.

† Significant at 0.001 level.

Analysis of the matched hospital data also produced results consistent with those above ($\chi^2_1 = 0.01$, $P = 0.92$), including the same estimate of 0.97 for relative risk (Table 20). Table 31 shows the result of the logistic regression analysis of the data. Previous induced abortion was found to be unrelated to mid-trimester spontaneous abortion (relative risk of 0.88 estimated from the model). The hospital data were somewhat limited when the analysis considered parity and previous spontaneous abortion (Table 22). But we found no evidence to suggest that nulliparous women with a history of single induced abortion had a higher (or lower) risk of subsequent mid-trimester spontaneous abortion than women who had had one or no previous birth.

The six factors associated with previous induced abortion (age at abortion, number of induced abortions, gestation weeks at previous abortion, abortion procedure, use of laminaria, and complications) are examined in Table 32, which shows relative risks of spontaneous fetal loss for the abortion and control groups. None of the relative risks was significant. We did find mid-trimester fetal loss to be higher (but not significantly so) among women who had had the D&C procedure

TABLE 31 Estimated coefficients of multivariate logistic function and significance test for spontaneous second-trimester fetal loss: hospital data

Variable	Coefficient	Standard error	z
Constant	-1.159		
Year of outcome	-0.047	0.060	-0.78
Woman's age	0.023	0.021	1.09
Race			
Hawaiian or part-Hawaiian	-0.191	0.236	-0.81
Filipino	-0.518	0.262	-1.97*
Oriental	-0.370	0.229	-1.62
Other	-0.080	0.366	-0.22
Resident island	0.363	0.223	1.63
Pregnancy order	0.040	0.060	0.67
Current marital status	0.846	0.234	3.61†
History of induced abortion	-0.133	0.171	-0.78

Relative risk = $e^{-0.133}$ = 0.88.

* Significant at 0.05 level.

† Significant at 0.01 level.

(χ^2_1 = 2.50, P = 0.11); relative risk was 1.59. The difference was not evident, however, when analysis was confined to only those pregnancies preceded by a single prior pregnancy that had been deliberately terminated or when the analysis was based on all subsequent pregnancies (Table 33). The use of laminaria during the previous procedure was associated with a slightly lower rate of fetal loss (1.84 percent) than was nonuse (2.35 percent) among the abortion sample, but the difference was not significant (χ^2_1 = 0.17, P = 0.68) and the relative risk was 1.17 (Table 27). Further examinations of gestation time at last induced abortion and number of prior abortions jointly with abortion procedure showed no significant associations with subsequent mid-trimester spontaneous abortion, findings consistent with those presented in Tables 25, 26, and 28.

Third-trimester Fetal Loss

Because of generally low rates of third-trimester fetal loss, our study of this sequela suffers from small numbers of observations, especially

TABLE 32 Adjusted relative risks for second-trimester spontaneous fetal loss associated with factors of previous induced abortion (IA)

Factor	Relative risk	X^2_1
Age at first IA		
<20	1.09	0.08
20–24	0.70	1.94
25–29	0.99	0.01
>29	1.01	0.03
Number of IAs		
1	0.91	0.23
>1	0.80	0.19
Gestation weeks at last IA		
<9	0.91	0.10
9–12	0.96	0.005
>12	0.66	0.95
IA procedure		
D&C	1.59	2.50
Suction	0.88	0.25
Saline	0.52	1.03
D&C + suction	0.78	0.80
Use of laminaria		
No	0.94	0.05
Yes	0.76	0.70
Abortion complications		
No	0.86	0.66
Yes	1.32	0.31

in the abortion group. Only 14 cases of third-trimester fetal death were observed among 3,764 pregnancies of abortion cohort women (0.37 percent), in contrast to 632 among 93,857 pregnancies in the control sample (0.67%), as shown in Table 34. The difference was barely significant ($\chi^2_1 = 3.86$, $P = 0.05$), and the relative risk was 0.57, which is in the direction opposite to expectation if there were any adverse effect of prior induced abortion. Contrary to expectation, significant association was limited to pregnancies of the married group ($\chi^2_1 = 5.31$, $P = 0.02$, relative risk of 0.43, compared with $\chi^2_1 = 0.01$, $P = 0.92$, relative risk of 1.04 for the unmarried group). Lower risk for the abortion group persisted in the result of the multivariate logistic

TABLE 33 Second-trimester spontaneous fetal loss (SA), by method of abortion procedure

Type of data and SA or no SA	D&C	Suction	D&C + suction	Other	Total
Only prior pregnancy terminated by induced abortion, 1971–76					
SA	3	17	7	1	28
No SA	216	690	518	200	1,624
Total	219	707	525	201	1,652
p	0.0137	0.0240	0.0133	0.0050	0.0169
All subsequent pregnancies, 1971–78					
SA	19	41	41	3	104
No SA	757	2,082	1,973	522	5,334
Total	776	2,123	2,014	525	5,438
p	0.0245	0.0193	0.0204	0.0057	0.0191

regression analysis (Table 35), which produced borderline significance of the relative risk, 0.66 ($z = -2.04$, $P = 0.04$). To increase sample size, we included all repeat pregnancies of the same women in both samples for further analysis by the χ^2 method (Table 36). These data showed no longer statistically significant association between previous abortion and third-trimester fetal loss ($\chi^2_1 = 2.65$, $P = 0.10$); relative risk was 0.69.

The matched hospital data revealed no significant association ($\chi^2_1 = 0.43$, $P = 0.51$), although the estimated relative risk remained less than unity (0.76) (see Table 20). Table 37 shows the result of the logistic regression analysis, which is consistent with the above finding, the estimated relative risk being 0.81. The result of parity matched analysis also yielded no significant relationship between prior abortion and late fetal loss. None of the factors connected with previous abortion was found to be significantly related to the risk of late fetal death (Table 38), although the power of these tests is expected to be low. Further statistical treatment of this variable seemed unproductive because of the limited number of observations in the abortion group.

General Consideration

Our study on spontaneous fetal loss as a sequela of previous induced abortion suffers from a dilemma. Parity or pregnancy order is con-

TABLE 34 Third-trimester spontaneous fetal loss among abortion and control groups, by age and marital status

Age group and marital status	Abortion				Control			
	Fetal loss	No fetal loss	Total	Prop.	Fetal loss	No fetal loss	Total	Prop.
< 20								
Unmarried	1	197	198	0.0051	40	6,342	6,382	0.0063
Married	0	272	272	0	53	9,273	9,326	0.0057
20–24								
Unmarried	2	336	338	0.0059	33	4,705	4,738	0.0070
Married	4	1,103	1,107	0.0036	165	27,818	27,983	0.0059
25–29								
Unmarried	3	171	174	0.0172	14	1,929	1,943	0.0072
Married	3	1,049	1,052	0.0029	135	25,347	25,482	0.0053
> 29								
Unmarried	0	89	89	0	18	1,221	1,239	0.0145
Married	1	533	534	0.0019	174	16,590	16,764	0.0104
Total	14	3,750	3,764	0.0037	632	93,225	93,857	0.0067

$\chi^2_1 = 3.86$.

Significant at 0.05 level.

Relative risk = 0.57.

TABLE 35 Estimated coefficients of multivariate logistic function and significance test for third-trimester fetal loss: all vital data

Variable	Coefficient	Standard error	z
Constant	-5.729		
Year of outcome	-0.067	0.017	-3.98††
Woman's age	0.055	0.007	7.32††
Race			
Hawaiian or part-Hawaiian	0.112	0.113	0.99
Filipino	0.034	0.116	0.30
Oriental	-0.493	0.109	-4.50††
Other	-0.036	0.154	-0.23
Resident island	-0.071	0.105	-0.68
Current marital status	0.324	0.114	2.84†
History of induced abortion	-0.411	0.202	-2.04*

Relative risk = $e^{-0.411}$ = 0.66.

* Significant at 0.05 level.

† Significant at 0.01 level.

†† Significant at 0.001 level.

sidered to be an important covariate that must be allowed for in any analysis of fetal mortality. Our sample of subsequent pregnancies derived from the vital registration system was sufficiently large but deficient in information on the reproductive history of women with a history of early spontaneous abortion. In contrast, the hospital data had reliable information on reproductive history but suffered from a smaller sample size. Under these circumstances, the results from the two sources of data must complement each other.

No significant association was detected between induced abortion and the risk of second-trimester fetal loss from any source of data. Furthermore, no particular factor characterizing prior induced abortion was found to be associated significantly with the risk of second-trimester fetal loss in subsequent pregnancies.

In summarizing three major worldwide studies, Tietze (1981) noted that two out of seven comparisons showed significantly higher rates of mid-trimester fetal loss among nulliparous abortion women than

TABLE 36 Third-trimester spontaneous fetal loss of all subsequent pregnancies, including repeat pregnancies, among abortion and control groups, by age and marital status

Age group and marital status	Abortion				Control			
	Fetal loss	No fetal loss	Total	Prop.	Fetal loss	No fetal loss	Total	Prop.
< 20								
Unmarried	3	226	229	0.0131	44	6,552	6,596	0.0067
Married	1	320	321	0.0031	64	10,721	10,785	0.0059
20–24								
Unmarried	2	447	449	0.0045	35	4,984	5,019	0.0070
Married	5	1,559	1,564	0.0032	208	37,917	38,125	0.0055
25–29								
Unmarried	4	230	234	0.0171	15	2,067	2,082	0.0072
Married	5	1,555	1,560	0.0032	187	37,708	37,895	0.0049
> 29								
Unmarried	0	115	115	0	18	1,304	1,322	0.0136
Married	2	798	800	0.0025	238	25,710	25,948	0.0092
Total	22	5,250	5,272	0.0042	809	126,963	127,772	0.0063

$\chi^2_1 = 2.65$.

$P = 0.10$.

Relative risk = 0.69.

TABLE 37 Estimated coefficients of multivariate logistic function and significance test for spontaneous third-trimester fetal loss: hospital data

Variable	Coefficient	Standard error	z
Constant	-0.320		
Year of outcome	-0.090	0.121	-0.74
Woman's age	0.104	0.042	2.47*
Race			
Hawaiian or part-Hawaiian	0.079	0.477	0.17
Filipino	-0.318	0.530	-0.60
Oriental	-0.526	0.462	-1.14
Other	0.183	0.740	0.25
Resident island	-0.388	0.450	-0.86
Pregnancy order	-0.191	0.122	-1.56
Current marital status	1.069	0.473	2.26*
History of induced abortion	-0.214	0.346	-0.62

Relative risk = $e^{-0.214}$ = 0.81.

* Significant at 0.05 level.

among control women of gravidity 1. One of these comparisons involved a group of women in California who had had two or more induced abortions (Harlap et al., 1979), and the other study was carried out in an Eastern European country (WHO Task Force, 1979). Those data represent situations distinctly different from the one in this study. Tietze's summary raises an interesting question, however, about the power of a test to detect a specified difference. To examine this question, we calculated the power of detecting a doubled risk (RR = 2) from our data, using the conditional power function (Miettinen, 1968). The power calculated from the data in Table 20 reached nearly 100 percent, indicating that in no way could we miss such a magnitude of effect of induced abortion if it was present in our data. Therefore, if there were any effect, it must indeed be small.

It has been hypothesized that instrumental dilation followed by curettage (D&C) causes cervical incompetence and causes higher risk of second-trimester fetal loss (Harlap et al., 1979; WHO Task Force, 1979). Our data provide no convincing support for the hypothesis.

TABLE 38 Adjusted relative risks of third-trimester spontaneous fetal loss associated with factors of previous induced abortion (IA)

Factors	Relative risk	X^2_1
Age at first IA		
< 20	0.79	0.06
20–24	0.80	0.09
25–29	0.25	1.37
> 29	0.92	0.06
Number of IAs		
1	0.61	1.45
> 1	1.68	0.36
Gestation weeks at last IA		
< 9	0.54	0.97
9–12	0.73	0.28
> 12	1.13	0.004
IA procedure		
D&C	na	na
Suction	0.90	0.001
Saline	1.04	0.11
D&C + suction	0.79	0.07
Use of laminaria		
No	0.61	1.26
Yes	1.04	0.02
Abortion complications		
No	0.62	1.33
Yes	1.77	0.30

na—not applicable.

First, comparison of the D&C procedure with the control and with other types of abortion procedure within the abortion cohort women did not reveal a significantly higher risk of mid-trimester spontaneous abortion. Second, the use of laminaria at the time of the prior induced abortion did not substantially reduce the risk of mid-trimester spontaneous loss from that of cases in which no laminaria was used. It is noteworthy, however, that the estimated relative risk was in the direction expected from the hypothesis, 1.59 for D&C procedure in relation to the control pregnancies.

The situation was somewhat different in the case of first-trimester fetal loss. There, the risk appeared to be higher for the abortion sample. The magnitude of the difference depended upon the sample and method of estimation, estimates of the relative risk ranging from 1.08 to 1.29. In view of the relatively small excess risk and inconsistent statistical significance, we cannot attach too much importance to these values.

One important factor has never been considered in studies of this nature. It relates to aspects of competition between spontaneous fetal loss and induced abortion among women who are determined not to carry an unwanted pregnancy to term. These pregnancies result in either spontaneous abortion or induced abortion. In this kind of study when the outcome is spontaneous abortion, it is included as an observation in the sample whether the study has a case-control or a cohort design, whereas the pregnancy is excluded from the sample if it is deliberately terminated. This problem need not complicate a comparison of rates of spontaneous loss in a cohort study if the exposure and control groups have a comparable proportion of such women. It is known, however, that the proportion of unwanted pregnancies is higher among women with a history of induced abortion (Tietze, 1981; Steinhoff et al., 1979). This fact would tend to increase the rate of spontaneous abortion in the abortion cohort.

Knowing that the competition reduces the spontaneous abortion rate to about a half of the level without competition (Potter et al., 1975), we can derive the expressions of unbiased frequency of spontaneous abortion (SA) among all pregnancies resulting in SA or live births (LB), in the absence of an adverse effect of prior induced abortion, as

$$s'_c = P[\text{SA}|(\text{SA or LB})] = \frac{s(1+p_0)}{2p_0 + s(1-p_0)} \quad \text{for the control group and}$$

$$s'_a = P[\text{SA}|(\text{SA or LB})] = \frac{s(1+p_1)}{2p_1 + s(1-p_1)} \quad \text{for the abortion cohort,}$$

where s is the general rate of spontaneous abortion applicable to both groups, p_0 is the proportion of wanted pregnancies in the control, and p_1 is the proportion of wanted pregnancies in the abortion cohort. Wanted pregnancy is the complement of unwanted pregnancy. Their respective odds are

$$\frac{s'_i}{1-s'_i} = \frac{s(1+p_0)}{2p_0(1-s)} \quad \text{and} \quad \frac{s'_a}{1-s'_a} = \frac{s(1+p_1)}{2p_1+s(1-p_1)}.$$

Then the relative risk (odds ratio) under either cohort or case-control design can be expressed as $(p_0 + p_0 p_1)/(p_1 + p_0 p_1)$.

As pointed out earlier (Chung, 1981), the relative risk under this condition increases with difference between p_0 and p_1 when p_0 is greater than p_1, as shown below.

	$p_0 = .80$			$p_0 = .75$			$p_0 = .70$		
p_1	.70	.60	.50	.65	.55	.45	.60	.50	.40
Relative risk	1.08	1.19	1.33	1.09	1.21	1.38	1.10	1.24	1.44

The relative risk also becomes larger as $1-p_0$ increases.

Unfortunately, no reliable data on p_0 and p_1 are available for other populations to judge the degree of bias associated with data from studies that report increased mid-trimester spontaneous abortion risk. But we do have independent estimates of these parameters from our ancillary study. These are $p_0 = 0.93$ and $p_1 = 0.65$ estimated from Table 17. The substitution of these values into the formula yields a relative risk of 1.22, which is within the range of the values observed in the main study. Therefore, we conclude that the small amount of excess risk in first-trimester spontaneous abortion observed for the abortion cohort women can be explained largely by the sampling problem attributable to higher probability of unwanted pregnancy among women who had one or more prior induced abortions.

The observation that a higher risk of first-trimester fetal loss for the abortion group was limited to pregnancies of unmarried women needs explanation. One or both of the following factors could be responsible. First, the socioeconomic factors may have been unevenly distributed between the abortion and control samples in this group, confounding the outcome. Second and more plausibly, an unmarried woman whose unwanted pregnancy is terminated by spontaneous abortion is less likely to marry than an unmarried woman who has a normal pregnancy. The finding that the excess risk was more pronounced among younger women (Table 18) provides support for this hypothesis.

How then do we interpret the observed greater risk of first-trimester spontaneous abortion associated with early gestation stage (< 9 weeks) at time of previous induced abortion? The observation is in conflict with the general expectation that an abortion procedure performed at an early stage of pregnancy involves fewer complications and therefore is less likely to increase the risk of complications during a subsequent pregnancy than is an abortion performed at a later stage of gestation. It is not clear whether the apparent excess risk connected with early induced abortion is the result of statistical confounding yet to be explained or is a biological effect. In any event, if we allow for the sampling bias described above, the excess risk attributable to the early abortion is expected to be small. The magnitude of its possible effect can be seen by the following calculations. If we take the relative risk of 1.22 as the base for comparison, the increase due to early abortion is 1.40 – 1.22 = 0.18. The estimate would have a large standard error.

Harlap et al. (1979) found an increase in the risk of second-trimester spontaneous abortion among nulliparous women with a history of prior induced abortion, particularly among those who had had multiple induced abortions. Levin et al. (1980) observed significant increases in the risk of both first- and second-trimester spontaneous pregnancy losses among women who had experienced more than one induced abortion. None of these nor other studies adjusted for the bias in the estimates of relative risk due to the difference in the proportions of wanted pregnancies between the study and control groups. For this reason, their estimates of relative risk must be considered overestimates of the true relative risk of spontaneous fetal loss for the abortion group. As pointed out elsewhere (Chung, 1981), overestimation of the relative risk becomes more serious for women who have had repeated abortions because the probability of unwanted pregnancy increases with the number of induced abortions (Tietze, 1981). Thus it is likely that at least part of the increased risks of spontaneous pregnancy loss observed by those investigators may be explained by the bias.

The observed relationship between induced abortion and third-trimester fetal loss is somewhat puzzling. Although not all associations tested were significant, all estimates of the relative risk were less than unity and showed a slightly lower rate for the abortion group. It is difficult to suppose that induced abortion itself has a beneficial effect in reducing third-trimester fetal loss. There are at least two plausible explanations for the observation. First, it is possible that possible confounders not allowed for the present analysis may have produced the type I statistical error, producing a false positive association. Second, we could interpret the result as a consequence of the slightly increased risk of first-trimester spontaneous abortion on the hypothesis that a constant proportion of fetuses is subject to spontaneous death, the time of occurrence depending on when an adverse intrauterine condition is encountered. Under this hypothesis, such susceptible fetuses may be eliminated early in pregnancy by women who obtain an induced abortion, thereby reducing the probability of third-trimester fetal death.

Ectopic pregnancy

Ectopic pregnancy in the vital registration records was identified by ICDA (International Classification of Diseases, Adapted) code 769.3 in the field of standard (spontaneous) fetal death. Because of the generally low incidence of the condition, we modified our method of analysis somewhat. Analysis of the vital records was based on information stratified only by maternal age and marital status. A special report on the subject of ectopic pregnancy has been published elsewhere (Chung et al., 1982b). Therefore, this section includes much of the information presented in the earlier report. Our conclusion remains the same, though minor differences exist in the results of some analysis because of changes in the data set.

Table 39 shows the distribution by maternal age and marital status of ectopic pregnancies as reported in the vital data, for the abortion and control samples. The frequencies of ectopic pregnancies among all pregnancies resulting in deliveries or spontaneous abortions were 0.57 and 0.49 percent for the abortion and control groups, respectively. The overall incidence rate of 0.49 percent was slightly higher than that estimated for England and Wales in 1972 (Beral, 1975), where the incidence was estimated as 0.43 percent as ascertained from hospital discharge records. In our sample the risk of ectopic pregnancy increased consistently with maternal age, in agreement with the British study. Pregnancies of unmarried women were clearly at higher risk of being ectopic. The overall frequencies of ectopic pregnancy for the married and unmarried groups were 0.42 and 0.85 percent, respectively. The relationship with marital status suggests the importance of sociological factors in influencing outcome of a pregnancy. But the Mantel-Haenszel χ^2 test showed no evidence of association between history of induced abortion and subsequent ectopic pregnancy ($\chi^2_1 = 0.003$, $P = 0.96$), the relative risk being 1.18. The result remained

TABLE 39 Ectopic pregnancies among abortion and control groups, by age and marital status

Age group and marital status	Abortion group				Control group			
	Ectopic	No ectopic	Total	% ectopic	Ectopic	No ectopic	Total	% ectopic
< 20								
Married	0	290	290	0	7	9,688	9,695	0.07
Unmarried	1	217	218	0.46	22	6,830	6,852	0.32
20–24								
Married	3	1,175	1,178	0.25	87	28,937	29,024	0.30
Unmarried	6	367	373	1.61	45	5,111	5,156	0.87
25–29								
Married	4	1,100	1,104	0.36	135	26,370	26,505	0.51
Unmarried	3	181	184	1.63	38	2,091	2,129	1.78
> 29								
Married	5	555	560	0.89	122	17,453	17,575	0.69
Unmarried	1	96	97	1.03	24	1,356	1,380	1.74
Total	23	3,981	4,004	0.57	480	97,836	98,316	0.49

$\chi^2_1 = 0.003$.

$P = 0.96$.

Relative risk = 1.18.

TABLE 40 Estimated coefficients of multivariate logistic function and significance test for ectopic pregnancy: all vital data

Variable	Coefficient	Standard error	z
Constant	-7.289		
Year of outcome	0.085	0.020	4.22*
Woman's age	0.092	0.009	10.26*
Race			
Hawaiian or part-Hawaiian	-0.907	0.136	-6.66*
Filipino	-0.705	0.139	-5.07*
Oriental	-0.455	0.131	-3.47*
Other	-0.146	0.184	-0.79
Resident island	0.618	0.125	4.93*
Current marital status	1.383	0.137	10.08*
History of induced abortion	0.228	0.242	0.94

Relative risk = $e^{0.228}$ = 1.26.

* Significant at 0.001 level.

the same when the analysis was applied to a larger set of data that included repeated pregnancies of both groups ($\chi^2_1 = 0.27$, $P = 0.60$); in that case the estimated relative risk was 1.30. The result of the logistic regression analysis is given in Table 40 and is consistent with the preceding findings, the nonsignificant relative risk being 1.26.

The overall incidence of 0.54 percent estimated from the matched-pair hospital data was slightly higher than the earlier estimate of 0.49 percent, demonstrating a high degree of reliability of ascertainment of cases through the vital records (Table 41). No significant associa-

TABLE 41 Matched pairs, by combination of ectopic versus nonectopic pregnancy outcomes

	Control group		
Abortion group	Ectopic	Nonectopic	Total
Ectopic	0	22	22
Nonectopic	15	3,379	3,394
Total	15	3,401	3,416

NOTE: Frequency of ectopic pregnancy for abortion group = 0.64%; frequency of ectopic pregnancy for control group = 0.44%. Relative risk = 1.47.

tion was detected between history of induced abortion and subsequent ectopic pregnancy $(\chi^2_1 = 0.97, P = 0.32)$; estimated relative risk was 1.47.

Table 42 shows the result of the multivariate logistic function analysis. Interestingly, among the nine covariates considered, *only* maternal age and marital status were found to be significantly related to ectopic pregnancy. Pregnancy order did not contribute significantly to the risk of ectopic pregnancy, though an apparent association was in the negative direction. History of induced abortion showed no significant relationship $(z = 0.94, P = 0.35)$ to the resulting relative risk of $e^{0.330} = 1.39$, a finding consistent with the results from the earlier analysis. Because of the extremely small numbers of cases involved, the inconclusive result of parity-matched analysis is not presented here.

Notwithstanding the observed absence of significant association between history of induced abortion and ectopic pregnancy, we proceeded to examine possible relationships between factors associated with the induced abortion procedure and the risk of subsequent ectopic pregnancy, since the earlier tests of association may have missed

TABLE 42 Estimated coefficients of multivariate logistic function and significance test for ectopic pregnancy: hospital data

Variable	Coefficient	Standard error	z
Constant	-14.110		
Year of outcome	0.061	0.123	0.50
Woman's age	0.155	0.043	3.64*
Race			
Hawaiian or part-Hawaiian	-0.158	0.484	-0.33
Filipino	0.145	0.538	0.27
Oriental	0.294	0.468	0.63
Other	0.891	0.750	1.19
Resident island	0.101	0.456	0.22
Pregnancy order	-0.214	0.124	-1.73
Current marital status	1.997	0.480	4.16*
History of induced abortion	0.330	0.351	0.94

Relative risk = $e^{0.330} = 1.39$.

* Significant at 0.01 level.

TABLE 43 Adjusted relative risks of ectopic pregnancy associated with factors of previous induced abortion (IA)

Factors	Relative risk	X^2_1
Age at first IA		
<20	0.92	0.04
20–24	1.71	1.42
25–29	1.23	0.003
>29	1.91	0.29
Number of IAs		
1	1.51	1.06
>1	0.59	0.01
Gestation weeks at last IA		
<9	1.73	1.38
9–12	1.24	0.06
>12	1.02	0.13
IA procedure		
D&C	0.97	0.12
Suction	1.81	1.64
Saline	1.86	0.11
D&C + suction	1.09	0.005
Use of laminaria		
No	1.45	0.72
Yes	1.28	0.04
Abortion complications		
No	1.43	0.77
Yes	1.02	0.25

small effects of specific factors related to induced abortion. The result of the analysis of relative risk is given in Table 43. None of the six factors studied could be shown to be associated with subsequent ectopic pregnancy. We further examined several factors individually (Tables 44–47). None of the χ^2 values was found to be significant. But a test of association between ectopic pregnancy and abortion complications approached significance at the 5 percent level ($\chi^2_1 = 3.54$, $P = 0.06$), the estimated relative risk being 2.45 for the group of abortion women (Table 48).

TABLE 44 Ectopic pregnancy, by abortion procedure

Procedure	All pregnancies	Ectopic pregnancies	% ectopic
D&C	780	6	0.77
Suction	2,158	16	0.74
D&C + suction	2,037	4	0.20
Other	601	4	0.67
All procedures	5,576	30	0.54

$X^2_3 = 7.07$.
$P = 0.07$.

TABLE 45 Ectopic pregnancy, by use of laminaria at previous induced abortion

Use of laminaria	All pregnancies	Ectopic pregnancies	% ectopic
Yes	1,580	6	0.38
No	3,996	24	0.60
Total	5,576	30	0.54

$X^2_1 = 1.03$.
$P = 0.31$.

TABLE 46 Ectopic pregnancy, by number of previous induced abortions (IAs)

Number of IAs	All pregnancies	Ectopic pregnancies	% ectopic
1	4,707	26	0.55
⩾2	869	4	0.46
Total	5,576	30	0.54

$X^2_1 = 0.12$.
$P = 0.73$.

TABLE 47 Ectopic pregnancy, by number of gestation weeks at previous induced abortion

Gestation weeks	All pregnancies	Ectopic pregnancies	% ectopic
<9 weeks	2,330	17	0.73
≥9 weeks	3,245	13	0.40
Total	5,575	30	0.54

$\chi^2_1 = 2.74$.
$P = 0.10$.

TABLE 48 Ectopic pregnancy, by whether complications were associated with previous abortion procedure

Complications	All pregnancies	Ectopic pregnancies	% ectopic
Yes	423	5	1.18
No	5,151	25	0.49
Total	5,574	30	0.54

$\chi^2_1 = 3.54$.
$P = 0.06$.

Table 49 shows the rates of ectopic pregnancy among pregnancies followed by major postabortion complications. The numbers of ectopic pregnancy cases were small under the subgrouping, but it is evident that the risk of ectopic pregnancy was markedly higher for the groups of women who had infection or retained secundines than for women without reported postabortion complications. The relative risks were 2.78 and 6.65 for the infection and retained secundines groups, respectively. Since retained secundines are known to increase the probability of infection, these two conditions are likely to represent the same etiological factor in relation to ectopic pregnancy. We therefore pooled the two conditions to compare them with the remaining conditions, including no complications, for further analysis (Table 50). Analysis of the 2 × 2 contingency table showed a highly significant association between ectopic pregnancy and the presence or absence of the two types of complications ($\chi^2{}_1$ with continuity

TABLE 49 Ectopic pregnancy, by major type of complications associated with previous abortion

Type of complications	Ectopic pregnancy	No ectopic pregnancy	All pregnancies	% ectopic
None	25	5,126	5,151	0.49
Infection	1	73	74	1.35
Retained secundines	3	90	93	3.23
Hemorrhage	0	73	73	0
Cervical laceration	1	111	112	0 89
Other	0	71	71	0
All types	30	5,544	5,574	0.54

TABLE 50 Ectopic pregnancy, by infection or retained secundines and other complications

Complication	Ectopic pregnancy	No ectopic pregnancy	All pregnancies
Infection or retained secundines	4	163	167
Other	26	5,381	5,407
All complications	30	5,544	5,574

$X^2_c = 7.80$.

Significant at 0.005 level.

correction = 7.80, $P = 0.005$). The corresponding relative risk was 5.08. The rate of ectopic pregnancy among pregnancies without these complications was 0.48 percent, which was similar to that of the control group, or 0.49 percent.

The present investigation has clearly demonstrated that for pregnancies of women with a history of induced abortion, an increase in the risk of ectopic pregnancy depends strictly on whether or not the prior induced abortion was accompanied by complications such as infection or retained secundines, which increase the probability of subsequent infection. The corollary is that if induced abortion imposes no additional risk of these complications over other types of pregnancy outcomes, we would not expect to observe an excess risk of ectopic pregnancy among women with a history of prior induced abortion.

Unfortunately, we have no comparable information on the status of infection or retained placenta in the control group. But the overall observation that the women with a history of induced abortion did not have a significantly greater risk of ectopic pregnancy than the control group suggests that the specific postabortion complications were of minor consequence, if any, in increasing the incidence of extrauterine implantation in the abortion group under the conditions prevailing in Hawaii. These complications accounted for only 3 percent of the previous induced abortions in our data.

The contrary finding of positive association between history of induced abortion and ectopic pregnancy in Greece (Panayotou et al., 1972) could well be explained on the basis of a difference in postabortion complications, particularly since induced abortion is illegal in that country. It is also noteworthy that there was a significant increase in the stillbirth rate in Greece among women who had had a prior induced abortion (Pantelakis et al., 1973), in contrast to our finding in Hawaii.

Two factors tend to complicate the comparison of rates of ectopic pregnancy for women with prior induced abortion with a control group, even in the absence of a true adverse effect of induced abortion. They are related to the use of an intrauterine device (IUD) by women and the method of estimating the frequency of ectopic pregnancy cases.

First, some researchers have found that the probability of having ectopic pregnancy is higher among women who conceive with an IUD *in situ* than among other women (Tietze and Lewit, 1970; Seward et al., 1972; Vessey et al., 1974), although this point is disputed by others (Sivin, 1979; Ory, 1981). Furthermore, an earlier study of spontaneous abortion based on hospital data in Hawaii (Chung et al., 1982a) showed that there were twice as many IUDs *in situ* among pregnancies of women with a history of induced abortion than among the control group; the respective frequencies were 1.23 and 0.64 percent. To the extent that the experience of prior induced abortion is confounded with conception in the direction observed when an IUD is *in situ*, the incidence of ectopic pregnancy is overestimated for the abortion group. Because of low frequency of IUD *in situ* in the general population, however, the effect on the incidence of ectopic pregnancy may be expected to be small.

The second problem arises from the sampling procedure used in ascertaining ectopic pregnancy cases. As was done in this study, the incidence of ectopic pregnancy is usually computed as the proportion of cases among all pregnancies resulting in live birth and spontaneous fetal death, excluding subsequent induced abortions. Such a procedure tends to overestimate the rate of ectopic pregnancy for the abortion group. This problem arises because, compared with the control group, a smaller proportion of subsequent pregnancies results in delivery or spontaneous abortion owing to the already discussed higher rate of repeated induced abortions among the abortion group and to the fact that ectopic pregnancy is classified as spontaneous fetal death. The net result is that in the abortion group disproportionately more ectopic pregnancies are included in the numerator than in the denominator, thereby inflating the frequency and leading to a higher estimate of relative risk, even in the absence of effect of induced abortion. The quantitative relationship of this problem with estimation of the relative risk of spontaneous abortion has been presented elsewhere (Chung, 1981) and was further described in the previous section.

The consideration of these factors suggests that a relative risk estimate higher than unity can be expected in the absence of any adverse effect of induced abortion on subsequent pregnancy. Our observed values of nonsignificant relative risk are within the range expected. We therefore conclude that induced abortion has little or no effect on the risk of ectopic pregnancy in subsequent reproduction, if it is performed under generally favorable conditions.

Short gestation

We defined short gestation as completed gestation length of less than 37 weeks. The possible effect of induced abortion on short gestation was studied in two ways: first, by examining proportions of pregnancies characterized by short gestation and, second, by investigating mean gestation length. For the present analysis, only live births of gestation length of 20 weeks or more were considered. As with analysis of spontaneous abortion and ectopic pregnancy, pregnancy outcomes with multiple births, repeat pregnancy, or unknown maternal race were excluded from the analysis.

Table 51 shows short gestation and mean gestation length by maternal age and parity. Parity was grouped into nulliparous (parity = 0) and parous (parity ⩾ 1). Shorter gestation length tended to be associated with increasing parity as seen in both the proportion of short-

TABLE 51 Short gestation among abortion and control groups, by age and parity
(Parity classified as 0 or 1+ for both groups)

	Abortion group					Control group				
Age group and parity	Short gest.	No short gest.	Total	Prop.	Mean	Short gest.	No short gest.	Total	Prop.	Mean
< 20										
0	37	351	388	0.0954	39.758	1,585	11,104	12,689	0.1249	39.395
1+	6	39	45	0.1333	38.667	279	1,589	1,868	0.1494	39.175
20–24										
0	75	824	899	0.0834	39.808	1,622	18,051	19,673	0.0824	39.795
1+	38	382	420	0.0905	39.776	924	9,582	10,506	0.0879	39.730
25–29										
0	40	602	642	0.0623	39.835	789	11,035	11,824	0.0667	39.831
1+	47	445	492	0.0955	39.648	1,004	12,397	13,401	0.0749	39.755
> 29										
0	9	154	163	0.0552	39.656	401	3,666	4,067	0.0986	39.369
1+	35	336	371	0.0943	39.563	1,087	10,507	11,594	0.0938	39.461
Total	287	3,133	3,420	0.0839	39.732	7,691	77,931	85,622	0.0898	39.647

$\chi^2_1 = 0.97$.

$P = 0.32$.

Relative risk = 0.94.

gestation pregnancies and the mean gestation length. But short gestation was more common among younger women, particularly among those under 20. No significant association was detected, however, between short gestation and history of induced abortion when the Mantel-Haenszel χ^2 test was applied to 40 strata formed by maternal race, age, and parity ($\chi^2{}_1 = 0.97$, $P = 0.32$, relative risk = 0.94). Table 52 shows the comparison of the two samples in which parity of the control group was incremented by one. The result of the comparison of these data was not significantly different from the preceding one ($\chi^2{}_1 = 3.54$, $P = 0.06$, relative risk = 0.88), suggesting that increase in gravidity due to induced abortion is not of major importance in effecting shorter gestation. Table 53 shows the result of the logistic regression analysis on all the vital data. The effect of induced abortion was found to be nonsignificant, the estimated relative risk being 0.89 ($z = -1.85$, $P = 0.06$).

Table 54 presents the matched hospital data. The result of matched pair analysis is consistent with the above findings, again showing no significant association between short gestation and induced abortion ($\chi^2{}_1 \cong 0$, relative risk = 1.00). The result of analysis based on the multivariate logistic model applied to the hospital data is shown in Table 55. Filipino and Oriental women tend to have short gestations more frequently than Caucasian women. Again, allowance of all the covariates under the logistic model did not change the relationship of short gestation with history of induced abortion observed earlier ($\hat{\beta}_I = -0.084$, $z = -0.72$, $P = 0.47$, relative risk = 0.92).

In the foregoing analysis, we defined short gestation as gestation length less than 37 weeks. The problem of premature delivery can also be studied by examining mean gestation length in relation to history of induced abortion. This approach has an advantage in that the variable can be treated as a continuous one in a model of standard multiple regression. For this analysis, independent variables included were year, sex of baby, maternal age, marital status, mother's years of education, parity, number of previous fetal deaths, and maternal race, in addition to the variable representing induced abortion. Polynomial terms of year, age, education, parity, and previous fetal death were also included as independent variables in the model (Table 56). The effect of induced abortion was studied alternatively by the presence (1) or absence (0) of an abortion history or by number of previous induced abortions as an independent variable along with the other covariates mentioned above.

TABLE 52 Short gestation of subsequent pregnancies among abortion
(Parity 0 versus 1 and 1+ versus 2+ for abortion and control groups,

Age group	Parity Abortion	 Control	Abortion group Short gest.	 No short gest.	 Total
<20	0	1	37	351	388
	1+	2+	6	39	45
20–24	0	1	75	824	899
	1+	2+	38	382	420
25–29	0	1	40	602	642
	1+	2+	47	445	492
>29	0	1	9	154	163
	1+	2+	35	336	371
Total			287	3,133	3,420

$X^2_1 = 3.54$.
$P = 0.06$.
Relative risk = 0.88.

Table 56 shows the partial regression coefficients and analysis of variance resulting from the regression analysis. All the independent variables, including history of induced abortion, except parity, were found to be significantly associated with gestation length. The statistical significance is not surprising in view of the extremely large sample size (N = 88,501). History of induced abortion was positively associated with gestation length ($F = 12.94$, $P < 0.001$). It is more meaningful, however, to examine the actual magnitude of the effect of induced abortion on gestation length. The partial regression coefficient (0.1816) indicates that women with a positive history of one or more induced abortions had on the average $7 \times 0.1816 = 1.27$ days longer gestation than women with no history of such events. If we express the effect in terms of number of induced abortions, the magnitude is even less, an average of $7 \times 0.0958 = 0.67$ day per induced abortion (Table 56). The practical significance of these effects is debatable.

Table 57 shows the comparisons of the abortion and control samples matched by outcome of previous pregnancy and parity. Although the numbers involved in these comparisons are somewhat limited, none of the comparisons showed a significant association between

and control groups, by age and parity
respectively)

		Control group				
Prop.	Mean	Short gest.	No short gest.	Total	Prop.	Mean
0.0954	39.758	224	1,408	1,632	0.1373	39.241
0.1333	38.667	55	181	236	0.2331	38.712
0.0834	39.808	625	6,947	7,572	0.0825	39.759
0.0905	39.776	299	2,635	2,934	0.1019	39.655
0.0623	39.835	478	6,783	7,261	0.0658	39.738
0.0955	39.648	526	5,614	6,140	0.0857	39.774
0.0552	39.656	323	3,320	3,643	0.0887	39.440
0.0943	39.563	764	7,187	7,951	0.0961	39.470
0.0839	39.732	3,294	34,075	37,369	0.0881	39.627

short gestation and induced abortion. But clear contrast can be noticed between the A1 versus P1 and A1 versus P0 comparisons. For gravida 2, the A1 groups had a higher rate of short gestation (0.0610) than the P1 group (0.0441), the relative risk being 1.38. The trend was reversed in the comparison of the A1 group (0.0385) with the P0 group (0.0680); relative risk was 0.57. The data suggest that nulliparous women with a history of single induced abortion are intermediate in their gestation length of subsequent pregnancy between nulliparous and primiparous women. Expressed in another way, a first induced abortion behaves as though it is half of a full-term pregnancy in its effect on gestation length of later pregnancy.

Table 58 shows the adjusted relative risks of short gestation in relation to factors associated with previous induced abortion. Among the six factors studied, only use of laminaria was associated significantly with the risk of short gestation in a subsequent pregnancy (χ^2_1 = 11.51, $P < 0.001$, relative risk = 0.46). Surprisingly, users of laminaria had a lower frequency of short gestation than others. A similar trend was also evident within the abortion cohort sample (χ^2_1 = 4.79, $P = 0.03$, relative risk = 1.30), as shown in Table 59.

TABLE 53 Estimated coefficients of multivariate logistic function and significance test for short gestation: all vital data

Variable	Coefficient	Standard error	z
Constant	-1.389		
Year of outcome	0.013	0.005	2.46*
Woman's age	-0.005	0.003	-1.83
Race			
Hawaiian or part-Hawaiian	0.472	0.036	13.16†
Filipino	0.624	0.037	16.99†
Oriental	0.278	0.034	8.11†
Other	0.582	0.049	11.83†
Resident island	-0.075	0.032	-2.35*
Pregnancy order	0.015	0.009	1.71
Current marital status	0.533	0.037	14.28†
Woman's education	-0.059	0.006	-10.29†
History of induced abortion	-0.117	0.063	-1.85

Relative risk = $e^{-0.117}$ = 0.89.

* Significant at 0.05 level.

† Significant at 0.001 level.

TABLE 54 Distribution of matched pairs, by combination of short gestation

	Control group		
Abortion group	Short gestation	No short gestation	Total
Short gestation	9	141	150
No short gestation	141	2,555	2,696
Total	150	2,696	2,846

NOTE: Frequency of short gestation for abortion group = 0.053. Frequency of short gestation for control group = 0.053. Relative risk = 1.00.

TABLE 55 Estimated coefficients of multivariate logistic function and significance test for short gestation

Variable	Coefficient	Standard error	z
Constant	-2.358		
Year of outcome	-0.038	0.042	-0.92
Woman's age	-0.043	0.015	-2.94*
Race			
Hawaiian or part-Hawaiian	0.305	0.163	1.87
Filipino	0.583	0.182	3.20*
Oriental	0.441	0.158	2.79*
Other	0.066	0.253	0.26
Resident island	-0.049	0.154	0.32
Pregnancy order	0.136	0.042	3.24*
Current marital status	0.265	0.166	1.59
History of induced abortion	-0.084	0.118	-0.72

Relative risk = $e^{-0.084}$ = 0.92.

* Significant at 0.01

In summary, our data provide no indication that the experience of prior induced abortion has any adverse effect on gestation length leading to a higher rate of premature delivery. This observation is in contrast to earlier observations reported from Japan (Moriyama and Hirokawa, 1966), Eastern Europe (Miltenyi, 1964; Dolezal et al., 1970; Atanasov et al., 1972), and Greece (Pantelakis et al., 1973; Papaevangelou et al., 1973). But our findings are consistent with more recent studies, conducted in the United States (Daling and Emanuel, 1977; Schoenbaum et al., 1980) and other parts of the world (Daling and Emanuel, 1975; WHO Task Force, 1979; Obel, 1979a), that had better control of confounding variables. Summarizing ten major studies in the world, Tietze (1981) has estimated the unweighted mean of relative risk as 1.05, which is generally consistent with our results. The range of our relative risk is 0.57 to 1.38, depending on type of comparison. Our estimates of relative risk based on the vital records, however, were close to unity (0.94 and 0.89), as shown earlier. The differences in these estimates appear to depend on adjustment for

TABLE 56 Regression analysis of gestation-length testing effects of history of induced abortion (IA) and number of previous abortions

Variable	History of induced abortion	Number of induced abortions
Year	0.1731†	0.1762†
$(\text{Year})^2$	-0.0568††	-0.0573††
$(\text{Year})^3$	0.0040††	0.0040††
Sex	-0.2085††	-0.2084††
Age	0.1837††	0.1842††
$(\text{Age})^2$	-0.0036††	-0.0036††
Marital status	0.2426††	0.2421††
Education	0.0903††	0.0906††
$(\text{Education})^2$	-0.0031††	-0.0031††
Parity	-0.0042	-0.0043
$(\text{Parity})^2$	0.0006	0.0006
Previous fetal death	-0.0919††	-0.0873††
$(\text{Previous fetal death})^2$	0.0075†	0.0071†
Woman's race		
Hawaiian	-0.4659††	-0.4644††
Filipino	-0.8479††	-0.8466††
Oriental	-0.4016††	-0.3991††
Other	-0.5771††	-0.5773††
History of IA	0.1816††	X
Number of previous IAs	X	0.0958*
R^2	0.0231	0.0230
SSq due to regression on covariates	16,409.83	16,409.83
d.f.	17	17
SSq due to IA variable after fitting the above	102.20	44.40
d.f.	1	1
SSq residual	698,953.31	699,011.11
d.f.	88,482	88,482
Residual MSq	7.90	7.90
F	12.94††	5.62*

* Significant at 0.05 level.

† Significant at 0.01 level.

†† Significant at 0.001 level.

X Not tested.

TABLE 57 Matched-pair comparisons of short gestation (SG) and relative risks (RR) for specific combinations of reproductive history

	Abortion	Control	Abortion	Control	Abortion	Control
	A1	S1	A1	P1	A1	P0
SG	1	1	18	13	17	30
No SG	34	34	277	282	424	411
Total	35	35	295	295	441	441
p	0.0285	0.0285	0.0610	0.0441	0.0385	0.0680
X^2_1	0.51		0.54		3.24	
RR	1.00		1.38		0.57	

reproductive history of the mothers. Tietze (1981) reported that when women who had had only one prior abortion were compared with women pregnant with parity 1 (gravida 2), the relative risks were higher for this group than for women with parity 0 (gravida 1). Our data are consistent with this observation, with risk estimates of 0.57 and 1.38 (Table 57). The same trend was demonstrated when we compared nulliparous women having a history of one or more abortions with women with parity 0 or parity 1 without consideration of gravidity. The respective relative risks estimated were 0.94 and 0.88 (Tables 51 and 52). It is important to point out that in nearly all of our comparisons, the estimated relative risks were less than unity, though nonsignificantly so, suggesting that if there were any effect of abortion, it tended to reduce rather than increase the risk of short gestation.

We are now faced with the problem of explaining the observation that use of laminaria was associated in our study with a lower incidence of premature delivery. The lower rate was associated generally with an increase of gestation length for laminaria users (Table 59). It is not clear how such a relationship can be explained biologically. We hypothesize that cervical injury caused by nonuse of laminaria somehow reduces the gestation length of subsequent pregnancy. This hypothesis is consistent with the observation (Obel, 1979b) that among women who had undergone abortion by means of suction, cervical dilatation of 12 mm. or less was accompanied by a lower incidence of short gestation than dilatation of 13 mm. or more, though the differ-

TABLE 58 Adjusted relative risks for short gestation associated with factors of previous induced abortion (IA)

Factors	Relative risk	X^2_1
Age at first IA		
<20	0.86	0.66
20–24	0.90	0.41
25–29	1.18	0.47
>29	0.57	1.33
Number of IAs		
1	0.89	0.85
>1	1.00	0.01
Gestation weeks at last IA		
<9	0.77	2.34
9–12	0.95	0.08
>12	1.08	0.06
Procedure		
D&C	1.04	0.01
Suction	0.83	1.27
Saline	1.38	1.33
D&C + suction	0.82	1.23
Use of laminaria		
No	1.07	0.25
Yes	0.46	11.51*
Abortion complications		
No	0.92	0.46
Yes	0.75	0.54

* Significant at 0.001 level.

ence in the rates (7.3 versus 11.1 percent) was not significant. Further confirmation of the association is needed.

Low birth weight

In view of the observed racial variation in birth weight in Hawaii observed by Morton et al. (1967), it is neither realistic nor meaningful to use the usual criterion of 2,500 grams as a cutoff point for judging low birth weight, which is commonly used for Caucasian populations. Their study suggested that the equivalent birth weights should be

TABLE 59 Gestation length, by maternal age, parity, and use of laminaria at last induced abortion

	Laminaria				No laminaria			
Age group and parity	N	Short gest.	Prop. of short gest.	Mean gest.	N	Short gest.	Prop. of short gest.	Mean gest.
< 19								
0	135	11	0.081	40.26	259	27	0.104	39.47
1+	34	3	0.088	39.56	68	11	0.162	38.63
20–24								
0	319	20	0.063	39.87	627	56	0.089	39.71
1+	272	26	0.096	39.90	599	71	0.119	39.40
25–29								
0	193	12	0.062	40.02	484	30	0.062	39.74
1+	242	18	0.074	39.62	713	73	0.102	39.50
> 29								
0	50	2	0.040	40.10	135	7	0.052	39.61
1+	140	15	0.107	39.44	455	45	0.099	39.47
Total								
0	697	45	0.065	40.00	1,505	120	0.080	39.67
1+	688	62	0.090	39.69	1,835	200	0.109	39.43

$X^2_1 = 4.79$.

Significant at 0.03 level.

Relative risk = 1.30.

2,300 grams for Japanese and Chinese, and 2,200 grams for Filipinos. We therefore used the following criteria for deciding race-specific low birth weights in our study: 2,500 grams for Caucasians and Hawaiians or part-Hawaiians, 2,300 grams for Orientals, 2,200 grams for Filipinos, and 2,400 grams for other racial combinations. The last category is rather arbitrary but reasonable because the majority of "Other" subjects were interracial crosses involving Caucasians or Hawaiians. Thus, for a given racial group, any newborn weighing the race-specific number of grams or less was considered to have a low birth weight. As in the case of gestation length, the data included only single live births occurring after a gestation length of 20 weeks or longer.

Table 60 shows the proportions of low birth-weight infants and

TABLE 60 Low birth weight (LBW) associated with subsequent pregnancies of abortion and control groups, by age and parity
(Parity classified as 0 or 1+ for both groups)

	Abortion group					Control group				
Age group and parity	LBW	No LBW	Total	Prop.	Mean	LBW	No LBW	Total	Prop.	Mean
< 20										
0	26	362	388	0.0670	3185.4	959	11,730	12,689	0.0756	3166.7
1+	4	41	45	0.0889	3151.4	187	1,681	1,868	0.1001	3149.9
20–24										
0	45	854	899	0.0501	3217.6	1,067	18,606	19,673	0.0542	3230.7
1+	21	399	420	0.0500	3284.8	553	9,953	10,506	0.0526	3310.7
25–29										
0	23	619	642	0.0358	3306.1	511	11,313	11,824	0.0432	3220.3
1+	28	464	492	0.0569	3323.7	594	12,807	13,401	0.0443	3337.3
> 29										
0	6	157	163	0.0368	3210.8	268	3,799	4,067	0.0659	3159 [illegible]
1+	9	362	371	0.0243	3425.2	584	11,010	11,594	0.0504	3316.3
Total	162	3,258	3,420	0.0474	3275.4	4,723	80,899	85,622	0.0552	3252.7

$\chi^2_1 = 2.38$.

$P = 0.12$.

Relative risk = 0.88.

mean birth weights for the abortion and control samples as stratified by maternal age and parity. Parity was classified by numbers 0 and 1 or more. In general, the abortion group tended to have a lower rate of low birth weight than the control group, though the difference was not significant ($\chi^2_1 = 2.38$, $P = 0.12$, estimated relative risk of 0.88). The respective overall frequencies of low birth weight were 4.74 and 5.52 percent. Table 61 presents a similar comparison, with nulliparous pregnancies excluded from the control group. The result is similar to that in Table 60, but the difference is barely significant ($\chi^2_1 = 4.05$, $P = 0.04$, estimated relative risk of 0.84). These results should be interpreted with extreme caution because many factors known to influence birth weight were not allowed for in these analyses. One of the more important factors is race of the child, which was not considered in these analyses. Morton et al. (1967) observed that birth weight is determined largely by child's race and there is no independent maternal effect in cases of interracial crosses. Furthermore, it is necessary to adjust for the effect of gestation length on birth weight to assess the net relationship between prior abortion and birth weight.

Table 62 shows the result of the logistic regression analysis of low birth weight on all the vital data. The independent variables include child's year of birth, mother's age, marital status, and education, pregnancy order, child's race, and gestation length. Child's race was coded to reflect the proportions of the given racial groups in outcrosses. The unknown racial category was created to take care of illegitimate births for which information on paternal race was missing. Despite uniformly significant associations of all of the covariates, reflecting the large sample size under the logistic model, it is indeed surprising that history of induced abortion remained nonsignificant in its relation to low birth weight ($\hat{\beta}_I = -0.078$, $z = -1.01$, $P = 0.31$). From the regression we estimated the relative risk for low birth weight to be 0.92. The result of the logistic regression analysis suggests that the Mantel-Haenszel χ^2 analysis is simply inadequate for studying birth weight because of its failure to account for numerous confounding variables.

Table 63 presents the analysis of the matched hospital data. The estimated relative risk of 1.14 was somewhat higher than the preceding ones but was not significantly different from unity ($\chi^2_1 = 0.91$, $P = 0.34$). The result of the logistic regression analysis is consistent with our earlier findings, the estimated relative risk being 0.97 ($\hat{\beta}_I = -0.030$, $z = -0.33$, $P = 0.74$), as shown in Table 64. Table 65 shows the result

TABLE 61 Low birth weight (LBW) associated with subsequent (Parity 0 versus 1 and 1+ versus 2+ for abortion and control,

Age group	Parity		Abortion group		
	Abortion	Control	LBW	No LBW	Total
< 20	0	1	26	362	388
	1+	2+	4	41	45
20–24	0	1	45	854	899
	1+	2+	21	399	420
25–29	0	1	23	619	642
	1+	2+	28	464	492
> 29	0	1	6	157	163
	1+	2+	9	362	371
Total			162	3,258	3,420

$\chi^2_1 = 4.05$.

Significant at 0.04 level.

Relative risk = 0.84.

of parity-matched comparisons for low birth weight. None of the differences between the abortion and control samples was significant when the A1 was contrasted to the S1, P0, and P1 groups, although the S1 comparison was limited by the small number of cases. However, it is noteworthy that the nulliparous control (P0) had a slightly higher rate of low birth weight than the abortion group (relative risk = 0.90), whereas the control group with parity 1 (P1) had a slightly lower risk of low birth weight than the abortion sample (relative risk = 1.08). This finding suggests that the pregnancy outcome of nulliparous women with a history of single induced abortion is intermediate between outcomes of nulliparous and parity 1 control women, as in the case of gestation length.

One could gain further insight into the relationship between prior induced abortion and birth weight of subsequent pregnancies by examining birth weight itself instead of low birth weight. The result of the regression analysis of birth weight is shown in Table 66, where birth weight is expressed in grams. The regression model replaced maternal race with race of the infant and included gestation length in addition to the same set of covariates considered earlier for the study of gestation length (Table 56). Interestingly, we found positive history

pregnancies of abortion and control groups, by age and parity
respectively)

		Control group				
Prop.	Mean	LBW	No LBW	Total	Prop.	Mean
0.0670	3185.4	153	1,479	1,632	0.0938	3155.6
0.0889	3151.4	34	202	236	0.1441	3110.5
0.0501	3217.6	374	7,198	7,572	0.0494	3320.6
0.0500	3284.8	179	2,755	2,934	0.0610	3285.1
0.0358	3306.1	280	6,981	7,261	0.0386	3324.0
0.0569	3323.7	314	5,826	6,140	0.0511	3352.9
0.0368	3210.8	192	3,451	3,643	0.0527	3278.1
0.0243	3425.2	392	7,559	7,951	0.0493	3333.8
0.0474	3275.4	1,918	35,451	37,369	0.0513	3313.9

of induced abortion to be associated significantly with higher birth weight ($F_{1,\ 88481} = 28.65$, $P < 0.001$), although the magnitude is relatively small: 46.43 grams higher for those with one or more prior induced abortions. When we examined the effect of number of previous induced abortions, the increase was 38.34 grams per abortion. These results are consistent with the earlier observation of a lower rate of low birth weight for abortion subjects of a given parity (Table 65). Stated in another way, there is generally a slight increase of birth weight for subsequent births of the abortion women; the increase could be attributed to an additional gravidity for that group, which was not allowed for in the regression analysis. We could judge the effect of an induced abortion in relation to the effect of a unit increment in parity from 0 to 1. From the partial regression coefficients, we estimate the increase to be 46.62 − 2.38 = 44.24 grams per parity, which should be contrasted to an average increase of 38.34 grams per abortion. On the basis of this evidence, it could be concluded that an artificially terminated pregnancy has an increasing effect on the birth weight of the baby of a subsequent pregnancy, but the magnitude of the increase is less (though not much less) than the effect of parity as characterized by a full-term delivery.

TABLE 62 Estimated coefficients of multivariate logistic function and significance test for low birth weight: all vital data

Variable	Coefficient	Standard error	z
Constant	25.174		
Year of outcome	-0.039	0.007	-6.05††
Woman's age	-0.010	0.003	-2.90†
Child's race			
Hawaiian or part-Hawaiian	0.120	0.027	4.46††
Filipino	-0.431	0.026	-16.89††
Oriental	-0.295	0.024	-12.48††
Other	-0.320	0.033	-9.66††
Unknown	-0.192	0.080	-2.41*
Pregnancy order	-0.027	0.011	-2.56*
Current marital status	0.350	0.060	5.87††
Woman's education	-0.028	0.007	-3.93††
Gestation length	-0.712	0.006	-124.96††
History of induced abortion	-0.078	0.077	-1.01

Relative risk = $e^{-0.078}$ = 0.92.

* Significant at 0.05 level.

† Significant at 0.01 level.

†† Significant at 0.001 level.

TABLE 63 Distribution of matched pairs, by combination of low birth weight (LBW)

	Control group		
Abortion group	LBW	No LBW	Total
LBW	6	132	138
No LBW	116	2,371	2,487
Total	122	2,503	2,625

Frequency of LBW for abortion group = 0.053.

Frequency of LBW for control group = 0.046.

Relative risk = 1.14.

TABLE 64 Estimated coefficients of multivariate logistic function and significance test for low birth weight: hospital data

Variable	Coefficient	Standard error	z
Constant	32.740		
Year of outcome	-0.037	0.033	-1.13
Woman's age	-0.019	0.011	-1.62
Race			
Hawaiian or part-Hawaiian	-0.117	0.128	-0.92
Filipino	-0.476	0.143	-3.33†
Oriental	-0.723	0.124	-5.83†
Other	-0.132	0.198	-0.67
Resident island	-0.562	0.120	-4.67†
Pregnancy order	0.045	0.032	1.36
Current marital status	0.289	0.130	2.22*
Gestation length	-0.880	0.025	-35.40†
History of induced abortion	-0.030	0.092	-0.33

Relative risk = $e^{-0.030}$ = 0.97.

* Significant at 0.05 level.

† Significant at 0.01 level.

TABLE 65 Matched-pair comparisons of low birth weight (LBW) and relative risks (RR) for specific combinations of reproductive history

	Abortion	Control	Abortion	Control	Abortion	Control
	A1	S1	A1	P1	A1	P0
LBW	4	1	13	12	18	20
No LBW	28	31	253	254	390	388
Total	32	32	266	266	408	408
p	0.1250	0.0313	0.0489	0.0451	0.0441	0.0490
X^2_1	0.87		0		0.03	
RR	4.00		1.08		0.90	

TABLE 66 Regression analysis of birth-weight testing effects of history of induced abortion (IA) or number of previous induced abortions

Variable	History of induced abortion	Number of induced abortions
Year	16.4305	16.8029
(Year)^2	-1.1322	-1.2179
(Year)^3	0.0250	0.0303
Sex	112.9292††	112.9457††
Age	11.7293††	11.6933††
(Age)^2	-0.1661††	-0.1655††
Marital status	84.4725††	84.6249††
Education	-5.0233	-5.0566
(Education)^2	0.4324†	0.4344†
Parity	46.6296††	46.6216††
(Parity)^2	-2.3856††	-2.3846††
Previous fetal death	-21.9420††	-22.2685††
(Previous fetal death)^2	1.1285*	1.1369
Baby's race		
Hawaiian	-91.2611††	-91.1753††
Filipino	-278.6780††	-278.6853††
Oriental	-231.4633††	-231.4630††
Other	1.2604	1.2572
Gestation	81.5447††	81.5567††
History of IA	46.4288††	X
Number of previous IAs	X	38.3441††
R^2	0.2412	0.2412
SSq due to regression on covariates	6,532.18X10^6	6,532.18X10^6
d.f.	18	18
SSq due to IA variable after fitting the above	6.6598X10^6	7.0950X10^6
d.f.	1	1
SSq residual	20,567.28X10^6	20,566.85X10^6
d.f.	88,481	88,481
Residual MSq	0.2324	0.2324
F	28.65††	30.53††

* Significant at 0.05 level; † Significant at 0.01 level; †† Significant at 0.001 level;
X Not tested.

The data from the regression analysis can also be used to predict the rate of low birth weight for the abortion group. The mean and the standard deviation of the entire control sample were 3,253 and 533.4 grams, respectively. Given the weighted mean of the race-specific prematurity criterion as 2,405 grams, we can predict the frequency of low birth weight as 0.0559 from a table of cumulative normal distribution, assuming that birth weight is normally distributed. When the mean of birth weight is displaced by 38.34 grams because of a prior induced abortion, the predicted frequency of low birth weight is 0.0475. These predictions are nearly identical to what we observed, 0.0552 and 0.0474 (Table 60). The corresponding relative risk is 0.85, compared with the earlier estimate of 0.88. This observation strengthens our earlier conclusion that the observed slightly lower frequency of low birth weight for the abortion sample can be attributed to the slight increase of mean birth weight for the group.

Table 67 shows the result of tests of possible association between factors associated with abortion procedure and low birth weight. None of the factors studied was found to be significantly related to the risk of low birth weight. This is not surprising in light of the negative association between abortion and low birth weight described above. The relative risk for the D&C procedure was higher than that of other factors (value of 1.36) but was not significantly different from unity.

Our findings on birth weight as a sequela variable of induced abortion are consistent with the results of other recent studies (Hogue, 1975; Daling and Emanuel, 1975; Daling and Emanuel, 1977; WHO Task Force, 1979; Obel, 1979a; Schoenbaum et al., 1980) in which confounding variables are better controlled. In summarizing various major studies, Tietze (1981) estimated the overall relative risk of low birth weight as 1.08, which is compatible with our estimates of relative risk. He also noted that there was a general tendency for the relative risk to increase as parity of the control group was changed from 0 to 1. Our data are again in agreement with that trend (Table 65). Thus it must be concluded that the experience of induced abortion in itself does not seem to have an adverse effect on the birth weight of subsequent delivery. Whatever effect is observed can be attributed to the biological effect of the prior pregnancy itself, which happened to result in artificial termination.

Two reports claim to find an association between abortion procedure and the risk of low birth weight. The WHO study (1979) found

TABLE 67 Adjusted relative risks for low birth weight associated with factors of previous induced abortion (IA)

Factors	Relative risk	X^2_1
Age at first IA		
< 20	1.04	0.07
20–24	0.99	~0
25–29	1.01	~0
> 29	0.92	0.02
Number of IAs		
1	1.03	0.05
> 1	0.86	0.38
Gestation weeks at last IA		
< 9	0.82	2.15
9–12	1.09	0.46
> 12	1.27	1.87
Procedure		
D&C	1.36	3.78
Suction	0.94	0.21
Saline	1.30	1.14
D&C + suction	0.85	1.15
Use of laminaria		
No	1.05	0.16
Yes	0.88	0.56
Abortion complications		
No	1.01	~0
Yes	1.02	~0

higher risk associated with the D&C procedure, whereas Obel (1979b) observed an increased risk of low birth weight for deliveries preceded by cervical dilatation of 13 mm. or more for the suction procedure. We calculated the relative risk to be 1.36 for the D&C procedure, which was not significant. Furthermore, it should be pointed out that significant association was found in only one of three city clusters studied by the WHO group, thus indicating an inconsistency. The observed association between degree of cervical canal dilatation and risk of low birth weight could be due to premature delivery, which was also affected (Obel, 1979b). If this hypothesis is confirmed, a good biological explanation for the phenomenon must be sought.

Pregnancy complications

In the vital records, pregnancy complications were rather loosely defined. For the period of 1968 through 1977, pregnancy complications included amnionitis, anemia, eclampsia, hyperemesis gravidarum, pre-eclampsia, premature rupture of membranes, pyelitis, Rh sensitization, toxemia, and other unspecified conditions. Beginning in 1978, placental abnormalities, renal disease, and edema replaced amnionitis, pyelitis, and toxemia, respectively, and urinary infection was added. For the purpose of overall analysis of these vital data, we recoded the information into the binary form as the presence (1) or absence (0) of one or more of these conditions.

Table 68 shows the rates of pregnancy complications of the abortion and control samples from the vital records, by age and parity. The overall frequencies of complications were similar, 0.0650 and 0.0629 for the abortion and control groups, respectively. The data show no significant association between previous abortion and pregnancy complication rates; the estimated relative risk was 1.10 ($\chi^2_1 = 1.74$, $P = 0.19$). But the situation was drastically altered when we contrasted the abortion sample with the control by incrementing parity for the control sample by one (Table 69). The abortion sample had consistently higher rates of complication than the control sample (overall rate of 0.0650 versus 0.0481). The association appears unquestionable, with a χ^2 value of 41.82 ($P \cong 0$) and a relative risk of 1.64. These observations strongly suggest that pregnancies of women with a history of single induced abortion behave much like nulliparous pregnancies not preceded by abortion.

The result of the logistic regression analysis further supports this conclusion (Table 70). Pregnancy order, which is largely determined by parity in these data, is clearly shown to be negatively associated with the risk of pregnancy complications; the higher the pregnancy order, the lower the risk. Other significant variables were year, maternal age, race, and mother's education. When all of these and other covariates were allowed for, the effect of induced abortion was not significant ($\hat{\beta}_I = 0.099$, $z = 1.32$, $P = 0.19$) and the relative risk (1.10) was identical to the first estimate shown above.

The hospital data on pregnancy complications were more extensive than those reported in birth certificates of the State Health Department. In addition to those recorded in the vital records, we included the following conditions as ascertained from hospital records: isolated

TABLE 68 Pregnancy complications of subsequent pregnancies of abortion and control groups, by age and parity
(Parity classified as 0 or 1+ for both groups)

	Abortion group				Control group			
Age group and parity	Complications	No complications	Total	Prop.	Complications	No complications	Total	Prop.
< 20								
0	22	364	386	0.0570	897	11,546	12,443	0.0721
1+	0	45	45	0	76	1,760	1,836	0.0414
20–24								
0	61	831	892	0.0684	1,442	17,986	19,428	0.0742
1+	21	391	412	0.0510	425	9,926	10,351	0.0411
25–29								
0	45	580	625	0.0720	801	10,824	11,625	0.0689
1+	29	459	488	0.0594	600	12,623	13,223	0.0454
> 29								
0	17	141	158	0.1076	389	3,587	3,976	0.0978
1+	24	341	365	0.0658	670	10,731	11,401	0.0588
Total	219	3,152	3,371	0.0650	5,300	78,983	84,283	0.0629

$\chi^2_1 = 1.74$.

$P = 0.19$.

Relative risk = 1.10.

occurrence of proteinuria or hypertension, abnormalities of amniotic fluid, vascular disorders, and gestational diabetes.

Table 71 shows the hospital data on 3,416 matched pairs. The overall rates of pregnancy-related complications derived from the hospital data were higher than those from the vital records, as expected; in fact, they were approximately twice those of the vital data. But no significant association could be detected between abortion history and pregnancy complications in subsequent pregnancies ($\chi^2_1 = 0.90$, $P = 0.34$). The estimated relative risk of 0.93 was consistent with the earlier observations. This finding is further corroborated by the result of the logistic regression analysis in Table 72, which indicates a relative risk of 0.95 and hence not a significant deviation from unity ($\hat{\beta}_I = -0.048$, $z = -1.63$, $P = 0.10$).

TABLE 69 Pregnancy complications of subsequent pregnancies of abortion and control groups, by age and parity

(Parity 0 versus 1 and 1+ versus 2+ for abortion and control, respectively)

Age group	Parity		Abortion group				Control group			
	Abortion	Control	Complications	No complications	Total	Prop.	Complications	No complications	Total	Prop.
< 20	0	1	22	364	386	0.0570	61	1,543	1,604	0.0380
	1+	2+	0	45	45	0	15	217	232	0.0647
20–24	0	1	61	831	892	0.0684	317	7,165	7,482	0.0424
	1+	2+	21	391	412	0.0510	108	2,761	2,869	0.0376
25–29	0	1	45	580	625	0.0720	351	6,845	7,196	0.0488
	1+	2+	29	459	488	0.0594	249	5,778	6,027	0.0413
> 29	0	1	17	141	158	0.1076	212	3,376	3,588	0.0591
	1+	2+	24	341	365	0.0658	458	7,355	7,813	0.0586
Total			219	3,152	3,371	0.0650	1,771	35,040	36,811	0.0481

$\chi^2_1 = 41.82$.

$P \cong 0$.

Relative risk = 1.64.

TABLE 70 Estimated coefficients of multivariate logistic function and significance test for pregnancy complications: all vital data

Variable	Coefficient	Standard error	z
Constant	-2.890		
Year of outcome	0.028	0.006	4.29†
Woman's age	0.021	0.003	6.67†
Race			
Hawaiian or part-Hawaiian	-0.211	0.042	-4.97†
Filipino	-0.394	0.043	-9.08†
Oriental	-0.655	0.041	-16.11†
Other	-0.208	0.058	-3.57†
Resident island	-0.009	0.038	-2.35
Pregnancy order	-0.096	0.010	-9.42†
Current marital status	-0.084	0.044	-1.90
Woman's education	-0.022	0.007	-3.19*
History of induced abortion	0.099	0.075	1.32

Relative risk = $e^{0.096}$ = 1.10.

* Significant at 0.01 level.

† Significant at 0.001 level.

TABLE 71 Distribution of matched pairs, by presence or absence of pregnancy complications

	Control group		
Abortion group	Complications	No complications	Total
Complications	59	364	423
No complications	391	2,602	2,993
Total	450	2,966	3,416

Frequency of complications for abortion group = 0.1238.

Frequency of complications for control group = 0.1317.

Relative risk = 0.93.

TABLE 72 Estimated coefficients of multivariate logistic function and significance test for pregnancy complications: hospital data

Variable	Coefficient	Standard error	z
Constant	-10.319		
Year of outcome	0.111	0.027	4.15*
Woman's age	0.009	0.009	0.97
Race			
Hawaiian or part-Hawaiian	-0.512	0.105	-4.86*
Filipino	-0.391	0.117	-3.35*
Oriental	-0.527	0.102	-5.17*
Other	-0.259	0.163	-1.59
Resident island	0.445	0.099	4.49*
Pregnancy order	-0.021	0.027	-0.77
Current marital status	-0.118	0.104	-1.14
History of induced abortion	-0.048	0.076	-1.63

Relative risk = $e^{-0.048}$ = 0.95.

* Significant at 0.01 level.

Table 73 presents the parity matched hospital data. Although none of the comparisons showed significant differences, there was a clear tendency for differences associated with parity of the control samples to confirm the earlier observations. The pregnancies of women whose only prior pregnancy was terminated by induced abortion (A1) tended to have a slightly lower rate of complications than those of the nulliparous control group (P0), whereas the reverse was true in relation to the P1 control group (relative risk = 1.33). There were too few observations in the spontaneous-abortion control group (S1) for a reliable comparison.

Table 74 shows specific pregnancy complications for the 3,416 pairs of pregnancies derived from hospital records. Nearly all types of complication were evenly distributed between the two groups. The only significant difference was observed for hyperemesis, as tested by χ^2 on the assumption that the data were unmatched ($\chi^2{}_1 = 9.55$, $P = 0.002$, relative risk estimated at 3.24). The significance of this finding is not clear if it does not represent a chance relationship. Using

TABLE 73 Matched-pair comparisons of pregnancy complications (PC) and relative risks (RR) for specific combinations of reproductive history

	Abortion	Control	Abortion	Control	Abortion	Control
	A1	S1	A1	P1	A1	P0
PC	6	10	35	27	71	93
No PC	34	30	298	306	463	441
Total	40	40	333	333	534	534
p	0.1500	0.2500	0.1051	0.0811	0.1330	0.1742
X^2_1	0.70		0.87		3.18	
RR	0.50		1.33		0.72	

TABLE 74 Number of specific pregnancy complications, by abortion and control samples: matched hospital data

Complication	Abortion	Control
None	2,994	2,966
Amnionitis	19	15
Anemia	34	37
Eclampsia	3	1
Hyperemesis	29	9
Pre-eclampsia	97	112
Premature rupture of membranes	190	209
Renal disease	4	1
Hemolytic disease	18	20
Edema	9	7
Proteinuria	2	1
Hypertension	13	24
Abnormalities of amniotic fluid	1	7
Vascular disorders	4	3
Gestational diabetes	44	53
Other	5	2

the hospital data and log-linear analysis, Kong (1981) examined factors specifically affecting pre-eclampsia. The factors studied were maternal age, parity, number of prenatal visits, month of first prenatal visit, and history of induced abortion. The analysis detected no significant association, thus confirming the present finding.

Table 75 shows adjusted relative risks for factors associated with abortion procedure based on the method of multivariate confounder scores. The only significant association was found with the D&C + suction procedure. But the relative risk estimate (0.76) was in the

TABLE 75 Adjusted relative risks of pregnancy complications associated with factors of previous induced abortion (IA)

Factors	Relative risk	X^2_1
Age at first IA		
<20	1.04	0.11
20–24	0.86	2.17
25–29	0.95	0.10
>29	1.10	0.16
Number of IAs		
1	0.96	0.31
>1	0.91	0.26
Gestation weeks at last IA		
<9	0.91	0.77
9–12	0.97	0.11
>12	1.02	0.005
Procedure		
D&C	1.32	3.65
Suction	1.00	0.001
Saline	1.12	0.28
D&C + suction	0.76	6.18*
Use of laminaria		
No	0.95	0.36
Yes	0.95	0.14
Abortion complications		
No	0.92	1.16
Yes	1.31	0.20

* Significant at 0.01 level.

TABLE 76 Pregnancy complications (PC) of subsequent pregnancies, by use of laminaria, abortion procedure, and parity

Procedure and parity	Laminaria				No laminaria			
	PC	No PC	Total	Prop.	PC	No PC	Total	Prop.
D&C								
0	2	32	34	0.0588	31	237	268	0.1157
1+	0	30	30	0	26	312	338	0.0769
Suction								
0	18	282	300	0.0600	43	540	583	0.0738
1+	8	280	288	0.0278	31	673	704	0.0440
D&C + suction								
0	16	273	289	0.0554	36	487	523	0.0688
1+	10	246	256	0.0391	40	636	676	0.0592
Other								
0	5	63	68	0.0735	12	161	173	0.0694
1+	6	78	84	0.0714	8	135	143	0.0559
Total	65	1,284	1,349	0.0482	227	3,181	3,408	0.0666

$\chi^2_1 = 4.09$.

Significant at 0.04 level.

Relative risk = 0.73.

direction opposite from that to be expected if the procedure had a harmful effect. When we classified the data simply by procedure and parity within the abortion cohort, we could detect no difference between suction (0.0533) and D&C + suction (0.0585), though the D&C procedure led to a higher incidence of pregnancy complications (0.0881). Table 76 shows that the use of laminaria at previous induced abortion produced a significantly lower rate of complications within the abortion sample ($\chi^2_1 = 4.09$, $P = 0.04$, relative risk of 0.73) than nonuse of laminaria.

Some previous studies reported a higher incidence of bleeding in the early stage of subsequent pregnancies of women with a history of induced abortion (Dziewulska, 1973; Harlap and Davies, 1975; Atanasov et al., 1972; Obel, 1979a), but Furusawa and Koya (1966) reported no such association. Unfortunately, our data contained no specific information on bleeding, but they were consistent with the conclusion reached by Schoenbaum et al. (1980) that women of second gravida with a history of single induced abortion are like nulliparous women with no such history of some types of complications.

Labor complications

For the period 1968–77, labor complications included the following specific conditions in addition to the "other" category in the vital records: placenta previa, abruptio placenta, other hemorrhage, prolapse of cords, breech presentation, other malpresentation, prolonged labor, and precipitate labor. Added in 1978 were three more specific conditions: fetopelvic disproportion, abnormality of pelvis, and multiple pregnancy. As in the case of pregnancy complications, we recoded labor complications into the binary form as presence (1) or absence (0) of one or more of these conditions for our analysis.

Table 77 shows the rates of labor complications for the abortion and control groups as stratified by maternal age and parity. The difference in labor complications between the abortion and control groups (11.96 and 11.00 percent, respectively) was slight, barely reaching a level of significance ($\chi^2_1 = 4.06$, $P = 0.04$, relative risk = 1.12). But the higher risk of labor complications for the abortion group proved to be unquestionable when parity was increased by 1 for the control group in the comparison (Table 78). In that case $\chi^2_1 = 111.18$, $P \cong 0$, and the estimated relative risk was 1.86. That the difference was largely limited to the comparison of nulliparous abortion women with primiparous control women indicates that it was due to parity between the two groups. This conclusion is further supported by the results of multivariate logistic regression analysis, in which the effects of pregnancy order as well as other factors were taken into account (Table 79). The regression analysis showed history of induced abortion to be nonsignificant (relative risk of 1.09).

The matched hospital data included additional labor complications: lacerations, retention of placenta, incompetent cervix, and C-sections (Table 80). Because of the expanded definition of complications, the overall rate of complications in the hospital data was approximately double that of the earlier estimate from the vital data. Even with the expanded definition of labor complications, however, no significant association was detected between abortion history and complications ($\chi^2_1 = 3.15$, $P = 0.08$), the relative risk of 0.90 being consistent with the preceding finding. Essentially, the same picture emerges from the

TABLE 77 Labor complications of subsequent pregnancies of abortion and control groups, by age and parity
(Parity classified as 0 or 1+ for both groups)

	Abortion group				Control group			
Age group and parity	Complications	No complications	Total	Prop.	Complications	No complications	Total	Prop.
< 20								
0	44	340	384	0.1146	1,301	10,959	12,260	0.1061
1+	3	42	45	0.0667	118	1,690	1,808	0.0653
20–24								
0	118	761	879	0.1342	2,516	16,558	19,074	0.1319
1+	33	380	413	0.0799	684	9,527	10,211	0.0670
25–29								
0	97	511	608	0.1595	1,693	9,685	11,378	0.1488
1+	34	449	483	0.0704	965	12,085	13,050	0.0739
> 29								
0	25	128	153	0.1634	780	3,089	3,869	0.2016
1+	44	318	362	0.1215	1,059	10,162	11,221	0.0944
Total	398	2,929	3,327	0.1196	9,116	73,755	82,871	0.1100

$X^2_1 = 4.06$.

Significant at 0.04 level.

Relative risk = 1.12.

multivariate logistic regression analysis, which yielded a nonsignificant relative risk of 0.96 (Table 81). Parity-specific comparisons of the matched data are shown in Table 82. Although none of the estimates of relative risk was significant, the parity effect observed in the earlier results from the vital data persisted in these data.

Table 83 shows the distribution of specific types of labor complications for the two groups, unadjusted for parity. Nearly all of the conditions were evenly distributed between the two groups. There were more cases of "other" lacerations among the control group than among the abortion group ($\chi^2_1 = 16.82$, $P \cong 0$), but the importance of this heterogeneous entity is questionable. Interpretation of other apparent differences between the abortion and control cohorts is difficult in the absence of allowance for parity effects. Using a log-linear

TABLE 78 Labor complications of subsequent pregnancies of abortion and control groups by age and parity
(Parity 0 versus 1 and 1+ versus 2+ for abortion and control, respectively)

	Parity		Abortion group				Control group			
Age group	Abortion	Control	Complications	No complications	Total	Prop.	Complications	No complications	Total	Prop.
< 20	0	1	43	340	384	0.1146	102	1,476	1,578	0.0646
	1+	2+	3	42	45	0.0667	16	214	230	0.0696
20–24	0	1	118	761	879	0.1342	505	6,870	7,375	0.0685
	1+	2+	33	380	413	0.0799	179	2,657	2,836	0.0631
25–29	0	1	97	511	608	0.1595	561	6,516	7,077	0.0793
	1+	2+	34	449	483	0.0704	404	5,569	5,973	0.0676
> 29	0	1	25	128	153	0.1634	323	3,195	3,518	0.0918
	1+	2+	44	318	362	0.1215	736	6,967	7,703	0.0955
Total			398	2,929	3,327	0.1196	2,826	33,464	36,290	0.0779

$\chi^2_1 = 111.18$.

$P \cong 0$.

Relative risk = 1.86.

TABLE 79 Estimated coefficients of multivariate logistic function and significance test for labor complications: all vital data

Variable	Coefficient	Standard error	z
Constant	−3.052		
Year of outcome	0.050	0.005	10.26*
Woman's age	0.029	0.002	11.96*
Race			
Hawaiian or part-Hawaiian	−0.154	0.032	−4.76*
Filipino	0.0001	0.033	0.004
Oriental	−0.324	0.031	−10.48*
Other	0.044	0.044	1.00
Resident island	0.037	0.029	1.28
Pregnancy order	−0.137	0.008	−17.71*
Current marital status	−0.217	0.034	−6.48*
Woman's education	−0.001	0.005	−0.26
History of induced abortion	0.089	0.057	1.56

Relative risk = $e^{0.089}$ = 1.09.

* Significant at 0.001 level.

TABLE 80 Distribution of matched pairs, by labor complications

	Control group		
Abortion group	Complications	No complications	Total
Complications	189	578	767
No complications	641	2,008	2,649
Total	830	2,586	3,416

Frequency of complications for abortion group = 0.2245.

Frequency of complications for control group = 0.2430.

Relative risk = 0.90.

TABLE 81 Estimated coefficients of multivariate logistic function and significance test for labor complications: hospital data

Variable	Coefficient	Standard error	z
Constant	-4.611		
Year of outcome	0.042	0.021	1.99*
Woman's age	0.024	0.007	3.24†
Race			
Hawaiian or part-Hawaiian	-0.116	0.083	-1.40
Filipino	0.016	0.092	0.17
Oriental	-0.258	0.080	-3.22†
Other	0.105	0.128	0.82
Resident island	0.033	0.078	0.42
Pregnancy order	-0.058	0.021	-2.73†
Current marital status	-0.205	0.082	-2.49
History of induced abortion	-0.038	0.060	-0.63

Relative risk = $e^{-0.038}$ = 0.96.

* Significant at 0.05 level.

† Significant at 0.01 level.

TABLE 82 Matched-pair comparisons of labor complications (LC) and relative risks (RR) for specific combinations of reproductive history

	Abortion	Control	Abortion	Control	Abortion	Control
	A1	S1	A1	P1	A1	P0
LC	12	12	75	70	116	130
No LC	28	28	258	263	418	404
Total	40	40	333	333	534	534
p	0.3000	0.3000	0.2252	0.2102	0.2172	0.2434
$X^2{}_1$	0.06		0.14		0.89	
RR	1.00		1.09		0.87	

TABLE 83 Number of specific labor complications, by abortion and control groups: matched hospital data

Complication	Abortion	Control
None	2,385	2,249
Placenta previa	16	18
Abruptio placenta	40	31
Antepartum hemorrhage	9	8
Cord abnormalities	22	23
Breech presentation	103	90
Other malpresentation	7	15
Prolonged labor	58	79
Precipitate labor	60	92
Uterine inertia, etc.	148	161
Cephalopelvic disproportion	95	93
Premature labor	104	90
Rupture of uterus	2	1
Cervical laceration	38	33
Other lacerations	337	446
Retention of placenta	48	74
Incompetent cervix	9	11
Primary C-section	219	208
Repeat C-section	87	109

model, Kong (1981) studied the effects of a number of factors specifically on premature labor, including history of induced abortion. She found no significant independent effect of previous abortion on the risk of the condition.

Table 84 shows the adjusted relative risks for factors associated with previous induced abortion. None of the factors studied was a source of significantly elevated relative risks.

In summary, our study has demonstrated no clear-cut association of prior induced abortion with the risk of labor complications in subsequent pregnancies, when the parity effect was properly allowed for. Thus our finding is generally in accord with those of earlier studies in Japan (Furusawa and Koya, 1966) and the United States (Obel,

TABLE 84 Adjusted relative risks of labor complications associated with factors of previous induced abortion (IA)

Factors	Relative risk	X^2_1
Age at first IA		
<20	0.98	0.05
20–24	0.95	0.47
25–29	0.96	0.10
>29	0.88	0.51
Number of IAs		
1	0.96	0.41
>1	0.94	0.18
Gestation weeks at last IA		
<9	0.96	0.20
9–12	0.87	3.13
>12	1.23	3.16
Procedure		
D&C	0.97	0.50
Suction	0.95	0.37
Saline	1.12	0.52
D&C + suction	0.90	1.41
Use of laminaria		
No	0.94	0.80
Yes	1.00	0.001
Abortion complications		
No	0.94	0.94
Yes	1.16	0.80

1979a; Schoenbaum et al., 1980), although all of the earlier studies concentrated on specific types of complications. Furusawa and Koya (1966) studied bleeding, length of labor, and use of instrumental delivery. Obel (1979a) examined the incidence of retained placenta or placental tissue, whereas Schoenbaum et al. (1980) investigated premature labor and placenta previa (or abruptio placenta). Our data do not support the finding of Slunsky (1964), who claimed an increased risk of premature labor associated with previous induced abortion. Clow and Crompton (1973) reported an increase of uterine rupture among women with a history of abortion, but our data provide little information on this point. We observed two cases of uterine rupture in the abortion group and one such case in the control group (Table 83).

Congenital malformations

It is well recognized that studies of congenital malformations tend to be constrained by incomplete ascertainment of cases and inaccurate diagnosis of specific malformations. Incidence estimates of major malformations vary with sources of case ascertainment. They range from 1–2 percent to 8 percent, depending on the study design (Chung and Myrianthopoulos, 1975). One important factor in ascertainment is time of diagnosis. Diagnosis generally improves with age of the infant (Myrianthopoulos and Chung, 1974). This study is confined to types of malformations detected at the time of birth through either the vital record system or hospital records. For that reason the degree of case ascertainment is expected to be incomplete. Incomplete ascertainment would not invalidate tests of the effect of abortion, however, since no difference in ascertainment is expected between the abortion and control groups.

The records obtained from the State Health Department followed three coding systems through the years. Depending on the year, the Department used its own codes specifying certain major malformations plus an unspecified category, ICDA codes, and a binary code assigning 1 to the presence and 0 to the absence of any malformation. For consistency, we recoded all the vital data uniformly into the binary format.

Table 85 shows the distribution of malformations for the abortion and control groups by maternal age and parity. The data included only live births following gestation of 20 weeks or longer, excluding multiple births. The overall incidence was about 1 percent, indicating a general underascertainment of cases. Morton et al. (1967) showed that ascertainment only by birth certificate underestimates the true population incidence. The Mantel-Haenszel χ^2 test showed no significant association between risk of malformation and history of induced abortion ($\chi^2_1 = 0.08$, $P = 0.78$, relative risk = 0.94). The result remained essentially unchanged when parity of the abortion group was matched with the control group at one higher parity ($\chi^2_1 = 0.06$, $P = 0.81$, relative risk = 0.94), as shown in Table 86. Allowance of

TABLE 85 Congenital malformations of subsequent pregnancies of abortion and control groups, by age and parity
(Parity classified as 0 or 1+ for both groups)

	Abortion group				Control group			
Age group and parity	Malf.	No malf.	Total	Prop.	Malf.	No malf.	Total	Prop.
< 20								
0	4	384	388	0.0103	127	12,562	12,689	0.0100
1+	0	45	45	0	29	1,839	1,868	0.0155
20–24								
0	8	891	899	0.0089	191	19,482	19,673	0.0097
1+	2	418	420	0.0048	118	10,371	10,489	0.0112
25–29								
0	6	636	642	0.0093	133	11,691	11,824	0.0112
1+	8	484	492	0.0163	125	13,223	13,348	0.0094
> 29								
0	1	162	163	0.0061	62	4,005	4,067	0.0152
1+	6	365	371	0.0162	133	11,414	11,547	0.0115
Total	35	3,385	3,420	0.0102	918	84,587	85,505	0.0107

$\chi^2_1 = 0.08$.

$P = 0.78$.

Relative risk = 0.94.

additional covariates by the logistic regression method yielded a nonsignificant relative risk of 0.98 (Table 87).

Table 88 shows the result of analyzing the matched hospital data. As expected, the overall incidence of congenital malformations ascertained in the hospitals was about 2 percent of all live births, double that obtained from birth certificates alone. Nevertheless, the risk of malformation remained independent of maternal history of induced abortion ($\chi^2_1 = 0.44$, $P = 0.51$, estimated relative risk = 1.13). This finding was further supported by the result of the multivariate logistic regression analysis (Table 89), which yielded a relative risk estimate of 1.12 ($z = 0.65$, $P = 0.52$). Parity-matched comparisons were less informative because of limited numbers of observed malformations

TABLE 86 Congenital malformations of subsequent pregnancies of abortion and control groups, by age and parity
(Parity 0 versus 1 and 1+ versus 2+ for abortion and control, respectively)

Age group	Parity		Abortion group				Control group			
	Abor- tion	Con- trol	Malf.	No malf.	Total	Prop.	Malf.	No malf.	Total	Prop.
< 20	0	1	4	384	388	0.0103	24	1,608	1,632	0.0147
	1+	2+	0	45	45	0	5	231	236	0.0212
20–24	0	1	8	891	899	0.0089	78	7,494	7,572	0.0103
	1+	2+	2	418	420	0.0048	40	2,877	2,917	0.0137
25–29	0	1	6	636	642	0.0093	64	7,197	7,261	0.0088
	1+	2+	8	484	492	0.0163	61	6,026	6,087	0.0100
> 29	0	1	1	162	163	0.0061	33	3,610	3,643	0.0091
	1+	2+	6	365	371	0.0162	100	7,804	7,904	0.0127
Total			35	3,385	3,420	0.0102	405	36,847	37,252	0.0109

$\chi^2_1 = 0.06$.

$P = 0.81$.

Relative risk = 0.94.

TABLE 87 Estimated coefficients of multivariate logistic function and significance test for congenital malformations: all vital data

Variable	Coefficient	Standard error	z
Constant	-4.362		
Year of outcome	-0.049	0.015	-3.30†
Woman's age	0.025	0.007	3.31††
Race			
Hawaiian or part-Hawaiian	0.278	0.099	2.82†
Filipino	0.212	0.101	2.10*
Oriental	-0.123	0.094	-1.31
Other	-0.024	0.135	-0.18
Resident island	-0.328	0.088	-3.72††
Pregnancy order	-0.033	0.024	-1.41
Current marital status	-0.035	0.103	-0.34
Woman's education	-0.032	0.016	-2.04*
History of induced abortion	-0.017	0.174	-0.10

Relative risk = $e^{-0.017}$ = 0.98.

* Significant at 0.05 level.

† Significant at 0.01 level.

†† Significant at 0.001 level.

TABLE 88 Distribution of matched pairs, by congenital malformations

	Control group		
Abortion group	Malformations	No malformations	Total
Malformations	3	77	80
No malformations	68	3,268	3,336
Total	71	3,345	3,416

Frequency of malformations for abortion group = 0.0234.

Frequency of malformations for control group = 0.0208.

Relative risk = 1.13.

TABLE 89 Estimated coefficients of multivariate logistic function and significance test for congenital malformations: hospital data

Variable	Coefficient	Standard error	z
Constant	-15.403		
Year of outcome	0.152	0.061	2.50*
Woman's age	-0.011	0.021	-0.50
Race			
Hawaiian or part-Hawaiian	0.335	0.239	1.40
Filipino	0.549	0.266	2.07*
Oriental	0.288	0.231	1.24
Other	0.318	0.371	0.86
Resident island	0.224	0.225	1.00
Pregnancy order	0.027	0.061	0.45
Current marital status	-0.267	0.237	-1.13
History of induced abortion	0.113	0.173	0.65

Relative risk = $e^{0.113}$ = 1.12.

* Significant at 0.05 level.

TABLE 90 Matched-pair comparisons of congenital malformations (CM) and relative risks (RR) for specific combinations of reproductive history

	Abortion	Control	Abortion	Control	Abortion	Control
	A1	S1	A1	P1	A1	P0
CM	2	1	4	11	10	4
No CM	38	39	329	322	524	530
Total	40	40	333	333	534	534
p	0.0500	0.0250	0.0120	0.0330	0.0187	0.0075
X^2_1	0		2.46		1.81	
RR	2.00		0.36		2.50	

(Table 90). The result was consistent with the foregoing observations, however. The small sample size of hospital data precluded separate treatment of specific types of malformations.

Table 91 summarizes the adjusted relative risk of factors associated with previous induced abortion. None of the factors investigated could be shown to be significantly related to the risk of congenital malformations in subsequent pregnancies of mothers with a history of induced abortion.

In view of our general finding of a lack of association between prior induced abortion and complications during subsequent pregnancies

TABLE 91 Adjusted relative risks of congenital malformations associated with factors of previous induced abortion (IA)

Factors	Relative risk	X^2_1
Age at first IA		
<20	1.25	0.84
20–24	1.03	0.001
25–29	1.11	0.04
>29	0.68	0.17
Number of IAs		
1	1.05	1.05
>1	1.44	1.11
Gestation weeks at last IA		
<9	0.74	1.22
9–12	1.29	1.40
>12	1.51	1.77
Procedure		
D&C	1.11	0.03
Suction	0.90	0.11
Saline	1.69	1.81
D&C + suction	1.15	0.25
Use of laminaria		
No	1.02	0.002
Yes	1.32	1.12
Abortion complications		
No	1.04	0.03
Yes	1.80	2.35

and deliveries, it is not surprising that no relationship could be found between abortion and the risk of congenital malformations in babies conceived later. Thus our conclusion is in agreement with recent studies done in the United States (Daling and Emanuel, 1977; Schoenbaum et al., 1980; Bracken and Holford, 1979) and Taiwan (Daling and Emanuel, 1975), in which confounding variables were reasonably well controlled. The only published report claiming malformations as an adverse effect of prior induced abortion was by Harlap and Davies (1975), who also reported many other adverse effects and whose sample may therefore represent an environment distinct from ours.

Postnatal death

For the purpose of this study, postnatal death was defined to include all deaths of single-born infants occurring within one year after reported birth. We took this as a measure of postnatal mortality in the hope that the measure accurately reflected long-term residual effects, if any, of induced abortion of previous pregnancies.

Table 92 shows the distribution of postnatal mortality rates for the study and control groups as grouped by maternal age and parity. No significant association emerged between the risk of postnatal mortality and induced abortion of previous pregnancies ($\chi^2_1 = 0.20$, $P = 0.65$), the relative risk being estimated at 0.92. This finding was further corroborated by logistic regression analysis incorporating other pertinent covariates (Table 93). The relative risk estimated from the model was 0.99 ($z = -0.08$, $P = 0.94$). Because of the probable biological irrelevance of parity to postnatal death, we did no further Mantel-Haenszel χ^2 on the data stratified by parity combinations.

Table 94 presents the distribution of mortality for the matched hospital data. The general mortality rate observed in these data was somewhat lower than that revealed by the vital records, but postnatal mortality was found again to be unrelated to prior induced abortion ($\chi^2_1 = 0.01$, $P = 0.92$), the estimated relative risk being 1.18. The death rates were 1.19 percent and 1.02 percent for the abortion and control groups, respectively. This finding was further supported by the logistic regression analysis (Table 95). Because of extremely small numbers of infant deaths, the result of the parity-matched comparisons was not very informative (Table 96).

Table 97 shows the adjusted relative risks and significance tests for the various factors associated with last induced abortion. Not surpris-

TABLE 92 Postnatal death (< one year) associated with subsequent pregnancies of abortion and control groups, by age and parity
(Parity 0 or 1+ for both groups)

Age group and parity	Abortion group Death	No death	Total	Prop.	Control group Death	No death	Total	Prop.
< 20								
0	5	383	388	0.0129	178	12,511	12,689	0.0140
1+	1	44	45	0.0222	63	1,805	1,868	0.0337
20–24								
0	11	888	899	0.0122	217	19,456	19,673	0.0110
1+	8	412	420	0.0190	220	10,269	10,489	0.0210
25–29								
0	8	634	642	0.0125	100	11,724	11,824	0.0085
1+	7	485	492	0.0142	225	13,123	13,348	0.0169
> 29								
0	2	161	163	0.0123	53	4,014	4,067	0.0130
1+	5	366	371	0.0135	200	11,347	11,547	0.0173
Total	47	3,373	3,420	0.0137	1,256	84,249	85,505	0.0147

$X^2_1 = 0.20$.

$P = 0.65$.

Relative risk = 0.92.

ingly, none of the factors studied was found to be a significant risk factor for postnatal death.

Our finding is consistent with recently published studies on the subject (Daling and Emanuel, 1975; Daling and Emanuel, 1977; Schoenbaum et al., 1980). One exception is again the study in Israel by Harlap and Davies (1975), who found a significant increase in the *neonatal* death rate among infants of women with a history of induced abortion. Since most of the other studies dealt with neonatal death (death occurring less than 28 days after birth), we also examined the incidence of neonatal death in our samples, using the linked vital records for this purpose. Tables 98 and 99 show the results of the

Mantel-Haenszel χ^2 analysis and the logistic regression analysis, respectively. The conclusion remains the same, demonstrating further consistency.

TABLE 93 Estimated coefficients of multivariate logistic function and significance test for postnatal death: all vital data

Variable	Coefficient	Standard error	z
Constant	−3.762		
Year of outcome	−0.020	0.013	−1.54
Woman's age	−0.002	0.007	−0.31
Race			
Hawaiian or part-Hawaiian	0.498	0.086	5.80††
Filipino	0.187	0.088	2.13*
Oriental	0.119	0.082	1.45
Other	−0.005	0.118	−0.04
Resident island	−0.052	0.077	−0.68
Pregnancy order	0.068	0.021	3.28†
Current marital status	−0.141	0.089	−1.58
Woman's education	−0.054	0.014	−3.93††
History of induced abortion	−0.012	0.151	−0.08

Relative risk = $e^{-0.012}$ = 0.99; * Significant at 0.05 level; † Significant at 0.01 level; †† Significant at 0.001 level.

TABLE 94 Distribution of matched pairs, by postnatal death status

	Control group		
Abortion group	Death	No death	Total
Death	1	33	34
No death	28	2,784	2,812
Total	29	2,817	2,846

Frequency of postnatal death for abortion group = 0.0119.

Frequency of postnatal death for control group = 0.0102.

Relative risk = 1.18.

TABLE 95 Estimated coefficients of multivariate logistic function and significance test for postnatal death: hospital data

Variable	Coefficient	Standard error	z
Constant	-2.921		
Year of outcome	-0.276	0.087	-3.17†
Woman's age	-0.040	0.031	-1.32
Race			
Hawaiian or part-Hawaiian	0.389	0.340	1.14
Filipino	0.773	0.380	2.03*
Oriental	0.501	0.330	1.52
Other	-0.087	0.528	-0.16
Resident island	-0.479	0.320	-1.50
Pregnancy order	0.160	0.088	1.82
Current marital status	0.588	0.347	1.69
History of induced abortion	-0.006	0.246	-0.02

Relative risk = $e^{-0.006}$ = 0.99.

* Significant at 0.05 level.

† Significant at 0.01 level.

TABLE 96 Matched-pair comparisons of postnatal death (PND) and relative risks (RR) for specific combinations of reproductive history

	Abortion	Control	Abortion	Control	Abortion	Control
	A1	S1	A1	P1	A1	P0
PND	1	0	2	3	6	2
No PND	34	35	293	292	435	439
Total	35	35	295	295	441	441
p	0.0286	0	0.0068	0.0102	0.0136	0.0045
X^2_1	0		0		1.14	
RR			0.67		3.00	

TABLE 97 Adjusted relative risks of postnatal death associated with factors of previous induced abortion (IA)

Factors	Relative risk	X^2_1
Age at first IA		
< 20	0.75	0.40
20–24	1.02	0.01
25–29	1.05	0.01
> 29	1.21	~0
Number of IAs		
1	0.93	0.02
> 1	1.03	0.03
Gestation weeks at last IA		
< 9	0.52	2.18
9–12	1.14	0.09
> 12	1.49	0.67
Procedure		
D&C	1.00	0.04
Suction	0.82	0.21
Saline	1.88	1.25
D&C + suction	0.85	0.07
Use of laminaria		
No	0.86	0.18
Yes	1.20	0.11
Abortion complications		
No	0.97	~0
Yes	0.65	0.07

TABLE 98 Neonatal death (< 28 days) associated with subsequent pregnancies of abortion and control groups, by age and parity

(Parity 0 or 1+ for both groups)

	Abortion group				Control group			
Age group and parity	Death	No death	Total	Prop.	Death	No death	Total	Prop.
< 20								
0	5	383	388	0.0129	135	12,554	12,689	0.0106
1+	1	44	45	0.0222	42	1,826	1,868	0.0225
20–24								
0	5	894	899	0.0056	178	19,495	19,673	0.0090
1+	5	415	420	0.0119	152	10,337	10,489	0.0145
25–29								
0	7	635	642	0.0109	78	11,746	11,824	0.0066
1+	6	486	492	0.0122	160	13,188	13,348	0.0120
> 29								
0	1	162	163	0.0061	48	4,019	4,067	0.0118
1+	5	366	371	0.0135	150	11,397	11,547	0.0130
Total	35	3,385	3,420	0.0102	943	84,562	85,505	0.0110

$\chi^2_1 = 0.15$.

$P = 0.70$.

Relative risk = 0.92.

TABLE 99 Estimated coefficients of multivariate logistic function and significance test for neonatal deaths: all vital data

Variable	Coefficient	Standard error	z
Constant	-3.986		
Year of outcome	-0.060	0.015	-3.98*
Woman's age	0.011	0.008	1.43
Race			
Hawaiian or part-Hawaiian	0.371	0.099	3.73*
Filipino	0.172	0.102	1.69
Oriental	0.103	0.095	1.08
Other	0.070	0.136	0.51
Resident island	-0.090	0.089	-1.01
Pregnancy order	0.006	0.024	0.27
Current marital status	-0.062	0.103	-0.60
Woman's education	-0.057	0.016	-3.61*
History of induced abortion	-0.001	0.175	-0.01

Relative risk = $e^{-0.001}$ = 1.00.

* Significant at 0.001 level.

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Population mobility and wealth transfers in Indonesia and other Third World societies

Graeme J. Hugo

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PREFACE

This is a revised version of a paper prepared for the Seminar on Interrelationships Between Demographic Factors and Income Distribution: Individuals and Families in Income Distribution, organized by the Committee on Interactions Between Demographic Variables and Income Distribution of the International Union for the Scientific Study of Population and held 6–9 April 1981 in Honolulu, Hawaii. I wish to acknowledge the assistance of the Department of Demography, Research School of Social Sciences, Australian National University, and the East-West Population Institute in the preparation of the paper. Thanks are also due to the anonymous referees of the paper, who provided helpful and insightful comments on an earlier version.

ABSTRACT This paper investigates the complex interrelationships between population mobility and income distribution in developing societies. It focuses especially upon the links established and maintained by movers with the families they leave behind and the ways in which these links relate to income distribution. In particular, it examines the impact and role of remittances. First, the difficulties of measuring remittances are discussed, and caution is advised in interpreting remittance data. Next, the paper investigates the frequently overlooked interrelationship between types of population mobility and remittances It then examines the incidence, extent, and determinants of remittances in Indonesia, particularly West Java, focusing on the role of the family. The implications of remittance patterns for income distribution are also discussed. The findings are related to those obtained from a review of the literature concerned with remittances in other low-income countries. Finally, some general comments are made concerning the role of migration and population mobility in intergenerational wealth flows within families and its significance with respect to Caldwell's wealth-flows theory of fertility decline.

THE PRECISE NATURE, direction, and magnitude of the complex, two-way interactive relationships between demographic variables and income distribution are little understood. The growing literature concerned with these relationships has concentrated upon the connections between income distribution and such demographic variables as rates of population growth, family formation, fertility, mortality, and age structure. As is the case in much demographic analysis, migration and population mobility have remained the poor relation among the major demographic processes, for little effort has been devoted to investigating their significance in relation to income distribution. The bulk of migration theory and most empirical studies assign a key role to income-related factors in initiating population movement from one region to another. In this paper, the emphasis is not so much upon the individuals and families who move as upon the links they establish and maintain with the families whom they leave behind and the ways in which those links relate to income distribution. In examining those links and their significance for income distribution, I focus attention on Indonesia and particularly on one region, West Java–Jakarta, where I conducted a detailed case study of population mobility and the wealth flows associated with it (Hugo, 1975, 1978). However, this paper places the discussion of the topic in a more general context by relating the Indonesian findings to a wider body of literature dealing with wealth transfers between movers and their places of origin in the developing world.

At the outset some key terms need to be clarified. The term "wealth flow" is adopted from Caldwell's (1976) theory of fertility decline based on wealth transfers between parents and children and is defined as all money, goods, services, and guarantees that one person provides for another. The term "wealth" is used instead of "income" so as to emphasize that the transactions involved in the flows are not all monetary. A fundamental distinction can be made between two types of wealth flow between and within households that are of contemporary significance in the Third World. The first type of flow consists of the periodic gifts, regular payments, and services that have traditionally been made between individuals and groups residing *within* a community, in order to support some members of that community or see them through a period of need. These individuals and groups are often, but not always, linked by family ties. The second type of wealth flow takes place between groups or individuals linked by ties that are usually family based but who reside in geographically separated communities. The latter flows usually take place as a result of some form of population mobility or migration, and it is upon them that most of the attention of this paper focuses.

When population movement does occur in low-income societies, strong linkages are usually established and maintained between movers at their destinations and their families and relatives who remain in the villages of origin. One of the most important results of these origin-to-destination ties is the two-way flow of money and resources. In migration research the term "remittance" is usually applied to money sent by migrants to their respective home areas. Following Connell et al. (1976), however, this paper extends the meaning of remittance to include the total flow of money and goods that migrants send or bring personally back to the area of origin (in-remittances) and also reciprocal flows from origin to destination (out-remittances). It is these flows—their extent, determinants, effects, and implications—that are the main focus of this paper.

It should be stressed that the concept of wealth flows is a much broader one than that of remittances. A wealth flow encompasses all money, goods, services, and guarantees provided by one person to another. It is a dynamic phenomenon, since both the volume and the direction of the flow varies over the life cycle of the family. The wealth transfer between parents and children is an aggregate measure of the net flow over the lifetime of the parents. Remittances, on the other hand, are confined to flows of money and goods and are customarily measured over a more restricted time interval. They therefore exclude services and guarantees, which are important elements in wealth flows between generations. Moreover, the volume and direction of the flow of remittances between a migrant and his or her family of origin during a particular year do not necessarily indicate either the net value or the overall direction of a wealth flow over the lifetime of the parent household. Thus, even if remittances can be shown to constitute the major part of the intergenerational transfer of wealth over the life cycle, the measurement of remittances over a limited period, without reference to the life-cycle stages of donors or recipients, cannot be taken as a reliable indication of even the direction of the net wealth transfers that are relevant to Caldwell's theory of fertility decline. Remittances represent only one subset of the totality of wealth flows within a society or family, although they can be a very important element in such flows.

MOBILITY, INCOME DISTRIBUTION, AND THE DEMOGRAPHIC TRANSITION

One of the most significant contributions to demographic knowledge of the last decade has been the reformulation of the demographic transition theory undertaken by Caldwell (1976, 1980). His theory, which explains stable high fertility in pretransitional societies and the onset of fertility decline in relation to net intergenerational wealth flows, suggests that fertility will fall once the net flow of wealth stops favoring parents and begins favoring children. Thus the fertility transition is dependent upon a change occurring in the distribution of income within the family.

This paper contends that population movement is of significance to Caldwell's wealth-flow theory in two fundamental areas. First, the nature, intensity, and pattern of population movement frequently influence the magnitude and type of net intergenerational wealth transfers that occur within a society. Second, this mobility often has a role in initiating the transition across what Caldwell (1976) refers to as "a great divide," a point where the compass needle hesitatingly begins to swing 180 degrees, from the situation in which the net flow of wealth is upward, toward parents, and high fertility is thus rational, to the situation in which the flow is toward children and high fertility is not rational. These linkages between fertility and population mobility are frequently overlooked because demographers tend to focus their investigations on single demographic processes such as fertility or migration. Yet the processes shaping population size, growth, structure, and distribution are tightly and inextricably interrelated (Friedlander, 1969:359).

The main task of this paper is to address the first of the two propositions advanced above—that is, to demonstrate the significance of population mobility and the remittances associated with that mobility in shaping the pattern of intergenerational wealth transfers. The paper also discusses the second proposition, regarding the role of population mobility in changing the direction of net intergenerational wealth flows.

Population mobility and the wealth transfers associated with it have a role not only in changing patterns of income distribution within the family but also, at a different level of scale, in initiating changes in income inequalities between regions. Indonesia, like much of the Third World, has a high overall incidence of poverty, and its pattern of income distribution is characterized by major interregional, rural-urban, intracommunity, and class disparities (Hugo, 1980, 1981e). The role of population movement in relation to income disparities in poor countries is a subject of debate in the literature. Neoclassical economists argue that voluntary population movements act in such a way as to reduce spatial inequalities in income distribution, whereas others have maintained that migration exacerbates spatial disparities in income distribution (Lipton, 1980:1). This issue of the interrelationship between population movement and interregional differences in income distribution constitutes a second theme relating to migration, remittances, and income distribution addressed in this paper.

THE MEASUREMENT OF REMITTANCES

In recent years several review studies have attempted to arrive at a consensus regarding whether regions of out-migration in less-developed countries have generally benefited from that out-migration (e.g., Amin, 1974; Connell et al., 1976; Connell, 1981; Griffen, 1976; Byres, 1979; Lipton, 1977, 1980; Rempel and Lobdell, 1978). Remittances constitute a major preoccupation in such studies; but they do not, as Connell

(1981:231) points out, represent the only element in the calculus of gain or benefit from migration in areas of origin. Such elements as transmission of skills, status and experience, flows of ideas, loss of economic and political leaders, and social disruption can influence development in an area of origin. But commentators have tended to focus attention on the role of remittances in rural development. Several (Amin, 1974; Connell, 1981; Lipton, 1977, 1980; Rempel and Lobdell, 1978) have suggested that the effect of money flows to villages of origin in the Third World is small and in many cases even, on balance, negative.

> The sparse evidence suggests that *net* remittances are quite small relative to village income, are concentrated on richer village households unlikely to suffer from capital constraints, and tend to be little used to finance investment, except in house-building. . . . (Lipton, 1980:3).

Others (e.g., Griffin, 1976; Byres, 1979) have argued, in contrast, that the net effect of remittances in out-migration villages is emphatically positive.

> Internal migration is likely to improve the distribution of income in rural areas. . . . Migration, in effect, enables the peasantry to overcome the imperfection of the rural credit market by creating opportunities to amass finance capital in the cities for subsequent investment in agriculture. . . . (Griffin, 1976:359).

Proponents of both points of view are able to marshall an impressive number of case studies to support their views. Only Connell (1981: 231–32) has sounded a cautionary note regarding the limitations of remittance data in such studies, and even he does not specify what the limitations are or how they should be taken into account in interpreting the studies' findings.

Elsewhere I have discussed some of the problems encountered in detecting wealth flows in West Java through intensive village studies (Hugo, 1977). The scope for error is considerable, even when highly-skilled and well-trained interviewers are used. Memory recall problems are a major difficulty. Corner, for example, found that "The men appeared fairly reliable in disclosing their expenditures but often did not think to mention to the recorder if money was received [although] . . . there seemed no reluctance to disclose the information" (1981:127). Another problem is recognizing that some flows constitute remittances (e.g., contributions to help pay educational expenses of siblings or to mount life-cycle ceremonies). There are difficulties in placing a realistic monetary value on the considerable flows of goods and produce; in many surveys these important flows are ignored altogether. Recall problems are exacerbated if the remittances are irregular and sent or brought back personally on a return visit to the village. (Such remittances are also overlooked in many studies.)

Unless there is detailed questioning of respondents–and this implies not only intensive training of interviewers but also field participation and field checking by the chief investigators–there is likely to be substantial underestimation of wealth flows. Many of the remittance studies reviewed do not include any measurement of out-remittances, so that no realistic impression of the net effect of income flows can be obtained from them. If one interviews the migrants themselves, they may inflate their estimates of income transfers to "save face" with the interviewer. Corner points out the difficulty of assessing how important remittances are in the total family budget at the place of origin because "home-produced and home-consumed items form a significant proportion of real-income and defy accurate measurement and valuation" (1981:120). If these and other difficulties of collecting remittance information are assumed away, especially in large-scale studies, the data used must be considered suspect.

Another important research issue is the period over which the remittances are measured. The usual convention is to attempt, on one hand, to avoid bias due to seasonal variations in remittances by collecting data for a year or more and, on the other, to minimize recall problems by questioning respondents at one time regarding out- and in-remittances over the reference period. Even if one assumes that respondents accurately report remittances received or sent during the reference period, there are problems associated with this approach if the aim is to gain an accurate impression of the volume of remittances. Many investigations (e.g., Corner, 1981:128) have found that remittances are sent irregularly and hence may not be detected from a question about a fixed time period. Yet such remittances may consist of quite large amounts, perhaps sent to meet a specific need–for example, to purchase land, build a house, compensate for the failure of an agricultural crop, contribute toward the costs of an expensive ceremony, or establish a business. Large remittances like these provide social insurance by alleviating crises. Hence, although they may be "called in" at any time and be seen as having critical importance to the well-being of the village household, their infrequency means that they are rarely detected by the conventional remittance question.[1] In fact, the use of a fixed reference period to measure wealth flows may have led some investigators to conclude incorrectly that income flows from migrants rarely result in investment in productive, developmental, employment-generating enterprises in the village. (See Lipton's 1980 review of the remittance literature.)

Another methodological lesson learned from field experience is that many respondents overlook in-remittances in reporting income unless the income question explicitly asks respondents to include all such flows in their estimates of total income.

These comments about the limitations of most measures of remittance flows are intended to caution readers against the uncritical acceptance of results presented in many migration studies. It is beyond the scope of this paper to address the complex methodological issue of how to collect adequate data on remittances. But a manual recently produced by the International Labour Office (Standing, 1981) discusses in detail important issues relating to measuring income transfers and remittances. And Corner (1981) makes several useful comments about the collection of remittance data.

TYPES OF MOBILITY AND REMITTANCES

In Indonesia, as in much of the Third World, there has been in the last decade or so a great increase in the personal mobility of a wide spectrum of the population, especially of people living in rural areas. This change has been facilitated by a virtual revolution in the provision of public transport, especially road transport, over much of the country, particularly in Java (Hugo, 1981a). There has been a great increase in the volume of commuting, circular migration, and seasonal migration (Hugo, 1981b). The bulk of this mobility, however, goes unrecorded in censuses and large-scale demographic surveys, which routinely adopt definitional criteria and questions long used in migration data collection in Western countries to detect predominantly long-distance and more or less permanent changes in usual place of residence (Hugo, 1975, 1981c).

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[1] For example, in a village I studied in West Java a respondent had just returned from visiting a cousin in Jakarta. Although the cousin had not seen the villager for a year or so before the visit, he gave him money to help him through a full season because the villager's rice crop had been ruined by flooding (Hugo, 1978:267).

The new mobility in Indonesia and elsewhere has important implications for wealth flows between movers and their families at the place of origin, because it has made available new options for generating such flows. The area over which members of a family can range in search of income opportunities, while not having to migrate permanently away from their home village, has considerably increased. Not only has this development encouraged more rural people to move and earn income outside the village, but also those who do move can return to the village more frequently and maintain other origin-destination linkages more readily than was previously the case. The remittance literature is preoccupied with migrants who migrate more or less permanently away from their places of origin. In general the literature differentiates between migrants crossing international boundaries and those moving within countries. Hence, Connell et al. (1976: 91) state that "international migration, both because it involves high initial costs and because it produces greater returns, records the highest rates of remittance."

Throughout Asia international worker migration, especially to the Middle East, has undergone a dramatic change in level, character, and socioeconomic implications in recent years. A major feature of this migration has been the high rates of return of the worker migrants and the high proportions of their income remitted to the home country (Hugo, 1981e; Keeley, 1980).

The question arises as to whether the conclusions about the benefits of international migration[2] can be extended to migration within a nation (Griffin, 1976:359). Lipton (1977), among others, has argued that such generalizations have been indiscriminate.

> The myth of huge urban-rural remittances, even net of reverse flows, may stem from false analogies with workseeking *international* migration. Turkish workers in Germany, Indians and Pakistanis in Britain and Algerians in France indeed remit large sums to their families in their countries of origin—but mainly to urban areas (Lipton, 1977:400).

In most studies of internal migration in which the investigators (e.g., Connell et al., 1976; Lipton, 1977, 1980; and Rempel and Lobdell, 1978) have reviewed remittance patterns, the patterns of migration are not at all comparable with those of international worker migration. Most international worker migrants move temporarily for a fixed period and have a definite commitment to return to their places of origin. Many leave in their places of origin their families of procreation (i.e., spouse and children) as well as their wider families, so that most of their long-term social, cultural, and economic commitments remain in the place of origin. The internal migrants described in the studies reviewed by the authors mentioned above tended to settle at the destination place. Because most of those studies were based upon household surveys using conventional sampling strategies, they had a bias toward the selection of migrants who moved with other family members and therefore made a relatively permanent commitment to staying at their destinations. Although many of such migrants have significant links with their places of origin, they usually have substantial and unavoidable financial commitments at their destinations, so that the amounts left over for remitting are small. Their situation contrasts with that of the international guestworkers, whose fixed costs at the destination are much smaller because dependent family members do not accompany them, and whose accommodation is often in barrack-type structures provided by employers. Thus the pattern of remittances tends to be quite different among international and internal migrants.

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[2] Remittances are only one aspect of the relationships between countries established by worker migration. Several authors (e.g., Bohning, 1975) have spelled out the negative, exploitative effects of worker migration and the dependency and international inequalities that it preserves.

In much of the Third World the more or less permanent, longer-distance internal migration studied by means of conventional surveys and censuses is only one subset–and often not the largest or most significant subset in its economic and social impact–of total population mobility (For a detailed discussion of this issue see Goldstein [1978].) In an intensive study of 14 villages in West Java (Hugo, 1975, 1978) I found that out-movement from village to urban areas and to other rural localities took several distinctive forms and that these forms had important implications for the volume, frequency, and significance of remittances. Table 1 presents a typology of the population mobility identified as occurring on a substantial scale between village and city in the West Java-Jakarta region. The various types of moves can be distinguished by the degree and type of commitment that movers maintain with their places of origin and establish at their destinations. In the extent to which movers leave their families of procreation behind in the village, invest economically in the village, and maintain political and social roles in the village, the types of movement

TABLE 1. A preliminary typology of rural-to-urban population mobility in Third World societies
(Based on West Java)

Type of mover		Characteristics of mover	Commitment to city	Commitment to village
Commuter		Works in city but returns to village each evening. May commute regularly (each weekday) or spasmodically (to market produce, etc.).	Little financial or social investment in city. Mixes with urban dwellers but on a limited basis.	High. Family of procreation remains in the village. Retains all political and social roles in village. May have village-based income source. Bulk of income earned in city spent in village.
Seasonal or shuttle migrant		Searches for work to augment meager agricultural income.	Little financial or social investment in city. Sleeps in group-rented room or employer-provided barracks. Social interaction almost entirely with other migrants from village. Employment in traditional or day-laboring sectors.	Family of procreation remains in the village. Retains all political and social roles in village. Remits bulk of income (after living expenses) to village. Retains village citizenship. Almost total orientation to village. Usually retains work source in the village.
Target migrant	Short-term sojourner	Comes to city for limited period (though longer than a season) to accomplish a specific purpose (e.g., reach a particular educational level).	Moderate. May bring family of procreation. Seeks more permanent accommodation (e.g., individually rented room). Has more interaction with settled urban population but retains close contact with fellow villagers in city. Usually employed in traditional sector.	Maintains strong links with family in village through visits and letters, although some roles may be temporarily given up. Remittances remain regular and high. Usually retains village citizenship. Usually retains a source of income in the village.
Life-cycle-stage migrant		Moves to the city at one or more specific stages of the life cycle.		

Working-life migrant	Spends entire working life in the city but intends to, and eventually does, retire to home village.	High. Family of procreation always accompanies. Purchases or builds individual housing, occupies employer- (e.g., government-) supplied housing or rents housing on a long-term basis. Often in a formal-sector occupation. Has high level of interaction with settled urban population but retains contact with fellow migrants through associations. Always transfers citizenship to the city. Assists new arrivals to city from home village.	Maintains sufficient links with village to ensure acceptance on eventual return. Makes investments in village housing and land, although unable to maintain most social and political roles. Sends periodic remittances to family. Makes return visits at end of fasting months and for important ceremonies.
Permanent migrant	Committed to exchanging a rural for an urban way of life.	Total.	Very little.
Undecided migrant	Has no clear intention to stay in the city or return to the village.	Unknown.	Unknown.

SOURCE: Adapted from Hugo (1983).

represent a continuum ranging from commuting through various types of circular, nonpermanent migration. All these elements influence the extent to which a mover feels obligated to remit money to his or her place of origin and also the individual's ability to remit, which is partly a function of the type and extent of commitment to the destination and hence the amount of fixed expenditure at the destination that is not available for remittance.

It can be seen from Table 1 that in many fundamental respects, especially the nature and degree of commitment to origin and destination, commuters and circular migrants (especially those whose moves are relatively short-term–i.e., seasonal, target, and life-cycle-stage migrants) have distinct similarities to the international temporary worker migrants mentioned earlier. Although it may be drawing a false analogy to compare international guestworkers to more or less permanent rural-to-urban migrants, this may not be the case for temporary internal population movers. Fan and Stretton (1980:23), in their consideration of circular migration in Southeast Asia, concluded: "From the point of view of the rural sector, remittances represent an important benefit of circular migration. While permanent migrants may also send funds to the village, the amounts are unlikely to be as large or regular." The West Java case study supports the contention that the net remittances of nonpermanent migrants are substantially greater and more significant than those of permanent migrants.

An important point to stress is that most of this temporary mobility is not detected in conventional household surveys, which means that remittances are severely underestimated in such surveys. An example of such underreporting occurs in the findings (Temple, 1975; Suharso et al., 1976) of a large-scale study that was conducted in Jakarta and other Indonesian urban centers at the same time as the West Java study referred to above. The study used household registers as a sampling frame and hence could include only migrants who had established a more or less permanent household in the city and who had officially changed their identification cards to indicate a Jakarta address. The study excluded all commuters and most circular migrants, since the latter tend to remain registered officially at their villages of origin and while in the city to sleep in barracks, in unfinished buildings, at their workplaces, with friends, or in the open rather than to own or rent urban-based permanent lodging. Of the 9,902 males included in the study, 34 percent were students, as were 24 percent of the 6,829 females, and they could not be expected to remit income to their villages of origin. The study found that about one in six migrants interviewed had sent money back to his or her village during the 12 months prior to the interview.

In contrast, urban-based studies carefully designed so as not to exclude circular migrants have revealed the importance of such migrants' remittances. Jellinek (1978), for example, in her study of more than 200 petty mobile traders in Jakarta, found that all but one was a circular migrant and that they were usually able to set aside up to a half of their city earnings to send back to the village. Her study thus provides urban-end support to the findings of the West Java village study that temporary migration is occurring on a substantial scale and that the rural-urban remittances initiated by this movement are significant.

Survey design and methodology are only one reason why migration studies have excluded temporary migrants from analyses of remittances. Another reason, at least in Indonesia, is that, although temporary mobility patterns have a long history in that country (see Hugo, 1981d), the huge scale of temporary migration is relatively recent. Thus studies initiated a decade or so ago may have overlooked it. This point is important in that most of the studies quoted to support the case that remittances are of little significance in the rural sector are based on fieldwork carried out more than a decade ago. Perhaps the most widely quoted data (especially by Lipton, 1980) are those derived from 40 Indian studies conducted in the late 1950s and early 1960s, which are analyzed in Connell et al. (1976). The applicability of such data two decades later is open to question, especially in the light of information in later studies (e.g., Kothari, 1980; Oberai and Singh, 1980).

The intention of the last two sections of this paper has not been to provide support for either side of the controversy over the net costs and benefits of migration to regions of out-migration in the Third World, but rather to indicate how difficult it is to assess the significance of income flows between movers and their families. It is difficult both because the remittance data themselves are frequently suspect and because much of the population mobility that gives rise to remittance flows is not included within the scope of many studies.

THE DETERMINANTS OF REMITTANCE FLOWS

The term used by Weisner (1972) in the title of his thesis concerned with rural-urban linkages in Kenya, "One Family, Two Households," is acutely evocative of the strong links that movers often maintain with their households of origin and that are critical determinants of the scale, regularity, nature, and size of remittance flows. The remittance literature suggests that whether or not remittances are sent, and the size and nature of remittances, are largely a function of (1) the nature of the mobility (temporary versus permanent, family versus individual, etc.); (2) the level and nature of the commitment felt by the mover to those left behind; (3) the amount of control that those left behind can exercise over the mover; (4) links maintained between mover and the family; (5) the level and nature of the needs of the migrant and the village kin; and (6) the type of employment, income, and living costs of the migrant. In these determinants the family clearly has a central role.

In some cases population mobility may be a direct outcome of a decision made within the family to spread the family's labor resources over a wider area than the home village.

> . . . the family as the subsistence unit assigns different roles in the family labor force to its members; determines differential access to family resources on the basis of kinship, age, title and other characteristics; attempts to exploit all available resources that sometimes include an external labor market; and determines the rules for passing on family holdings. The role assigned to an individual by the family in fulfilling these functions will inevitably be important in determining the relative motivation and incentive to migrate (Harbison, 1981:241).

In situations where the family makes a deliberate spatial allocation of its labor resources and makes decisions that involve separating one or more members from the home base, significant remittances usually result. Connell (1981:234) makes a useful distinction between two types of migration: "individual" where the decision to move is independent of kinship needs and obligations, and "linked" where the migration involves specific obligatory ties, usually financial, with kin in the village. The distinction is not a clear one, because the degree of commitment and linkage to home among movers in the Third World tends to occur along a continuum, as the typology in Table 1 suggests. But the size and frequency of remittances tend to be positively related to the extent of commitment or linkage between mover and village-based family.

Connell (1980:7–8) quotes several case studies in the Pacific, where the head of the nuclear family has responsibility for committing labor—not only within the home area, but also as far away as New Zealand, from where family members will send money back to the family on the home island. Similarly, Connell quotes (p. 8) evidence in India of this expansion of family income-earning opportunities developing "into a well organized and more permanent allocation of family resources, in terms of both time and finance." Kothari (1980:268), in his study of out-migration from four Rajasthani villages, notes that an individual's decision to migrate was often influenced by other household members, especially parents. Desai (1955:114) maintained that migration from Indian rural areas is "family oriented" rather than "individual oriented," so that the individual does not "come to the city to carve out his own future but to maintain the joint family at home." Srinivas (1966:138) observed that many Indian urban households are "satellites" of a joint family in a village several hundred miles away. Epstein (1973:207–9) found in her study of two South Indian villages that a "share family" type of arrangement exists, whereby family members are geographically dispersed but maintain such a level of contact that important decisions are taken jointly so that the welfare of the group is maximized. Davis (1951:108) suggested that a major factor inhibiting migration in India is the existence of the joint family system, where, in virtually all aspects of life, members of the family have definite roles that are assigned by the head of the family, who has absolute power over them.

Kothari (1980:299–302) has given the conventional explanation of why the joint family inhibits spatial mobility:

> . . . first, members of joint families, because of the obligations they have toward other members, cannot move freely even if opportunities are available elsewhere; second, there is a fear that joint family identification will not be retained once a member leaves the family; and third, since the older generation has absolute authority the traditional thinking of family elders restricts the actions of young people.

His findings, however, together with those from other field studies mentioned earlier, suggest that the opposite is the case—that the institution of a joint family enhances rather than hinders mobility. Kothari argues that such a family is in a better position to provide economic, social, and psychological support for migration in both normal and critical times and that, because the family exercises power over its members, remittances from urban employment are substantial and often increase the viability of the joint family in the village.

The fact that migration often occurs for the sake of the family, rather than the individual, may have an interesting bearing on family size in Third World societies. There are indications in the literature that family members who are asked to participate in income-earning activities away from the home village come disproportionately from particular positions within the family. Connell et al. (1976:46) refer to a number of studies that found birth order to be important in determining who in the family migrates, the choice depending upon the inheritance rules of the society. Kasdan (1964:35) suggests that male primogeniture increases the probability that younger sons will migrate. Wyon and Gordon (1971) found in the Punjab village they studied that parents kept older sons out of school to train them to take over the family's land holding, whereas younger sons were encouraged to stay at school in preparation for migration. Kothari (1980:282) found that first-born Rajasthani sons were the least mobile.

It appears obvious then that if there are perceived opportunities for the family to maintain or lift its level of consumption or savings by sending family members off to earn in more distant localities, it is not necessarily disadvantageous (and it may even be advantageous) to have a family size in excess of that required to maintain productivity in village-based activities. Some studies in India, where the joint family system is entrenched, suggest that this is the case. Lipton (1980:13) summarizes the Indian evidence thus: ". . . like the propensity to migrate, remittances per migrant seem to increase with the size of the nuclear family." Kothari (1980:306) found that large families appeared to have a deliberate strategy for diversifying their portfolios of human capital by financing investment in the migration of a family member; the expected return on that investment included future remittances. Hence migration occurred to a greater extent out of large families than out of smaller ones in which the option of migration was less available.

Large families also tend to benefit more from remittances than small families. Hence within pretransitional societies enhanced population mobility may serve to maintain stable high fertility levels by increasing the area over which the family can deploy its labor resources. Mamdani (1972:44) observes that in the several Indian villages he studied, increased population movement (most of it circular in nature) to cities ensured that the larger families of the villages were better off than smaller families; it thus contributed to a maintenance of stable high fertility.

Stark (1979:245) makes the important observation that "the migrating agent and the decision making unit no longer need coincide" in the Third World. Evidence for this view is Kothari's (1980:338) finding that for a quarter of the out-migrants in his Rajasthani village study the decision to move was made by the mover's father alone. Stark asserts that conventional models of rural-to-urban migration are based on the premise that migration is a consequence of individuals' decisions to maximize their expected income. However, when the decision-making unit is the village-based family or its head, the aim is often to maximize the family's or parents' expected income by means of the migrant's remittances and to ensure that the net lifetime balance of intergenerational wealth transfers remains heavily in favor of the parents. To this end the family may initially provide the individual mover with funds to enable him or her to move and become established at the destination.

Knowles and Anker (1977:3) have suggested that in studies of wealth flows the associated importance of population mobility is so great that the basic unit of study should not be the de facto household resident at the time of a survey but rather what they call the "economic" household. This is in essence a type of de jure household that includes not only persons resident at the time of survey but also heads of household absent and seeking work, dependent students attending school away from home, and children employed away from home but still contributing the bulk of their incomes to the rural household. They defined a person residing away from home as a member of the household if that person either received from or contributed to the household more than half of her or his income.

In many communities of developing societies the real motivation for moving out of the village is not an individual's desire for personal social and economic upward mobility but the need to support a village-based family. For example, Vredenbregt (1964:132), in a study of the highly mobile Bawean people, many of whom had moved from their small island (off the coast of Java) to Singapore, found that

> . . . *merantau* to Singapore was undertaken with the aim of making enough money to support the stay-at-homes. This type of financial aid . . . assumes two forms: individual aid by sending money or goods to relatives on Bawean,

> and collective aid by a *pondok* community in Singapore to its eponymous *desa* (village) on Bawean. [A Bawean *pondok* in Singapore consists of one or more houses in which the Bawean from one common *desa* live together.]

Similarly, Desai (1955:114) concluded that in India "the individual does not come to the city to carve out his own future but to maintain a joint family at home." In some societies, therefore, a fundamental initiating force in mobility is the need to meet kinship obligations by sending remittances back to the family.

In the West Java study (Hugo, 1975, 1978) I found that the reason for most circular migration and commuting (the major types of rural-urban mobility found within the study area) was to bring back income to the village. Such moves were perceived by those I interviewed almost wholly as a means to enhance the income of the village-based family. In West Java it would seem useful to amend Connell's (1981) distinction between "individual" and "linked" migrants by subdividing the latter into those whose links with the place of origin are through his family of procreation left behind and those whose links are through other family and local ties. The distinction suggests different levels of commitment to the village and motivation to remit on the part of temporary migrants (a great majority of whom are men), as well as the extent to which remittances are inter- and intragenerational.

The West Java findings illustrate how the type of mobility influences whether remittances will occur, and if so, their scale. Virtually all working commuters and circular migrants remit money to their village-based families. In most West Javan villages the nuclear family (*keluarga batih*) is the "unit of most decisions about consumption, savings and investment and the unit of most production (Palmer, 1967:315). Hence unmarried temporary migrants remit money mainly to their parents in the village, whereas married temporary migrants send or bring most of their money to wives and children. My data revealed that 22.7 percent of all remittances from circular migrants went to their families of origin and the bulk of the remainder to families of procreation.

Since most permanent migrants to urban areas from the West Javan villages (the study's temporal criterion of permanent migration was absence from the village for at least six months) tend to be accompanied by their families of procreation, one would expect them to remit fewer goods and less money to their villages than temporary migrants. Even after marriage, however, most West Javans feel a strong obligation to their parents, especially during the parents' old age when, because pension schemes are not widely available, children are responsible for the support of parents no longer able to work. Moreover, bonds of filial loyalty are so strong that many working migrants remit money and goods to parents who are still economically active. In my study area 52 percent of all permanent rural-to-urban migrants had brought or sent money to their parents in the year prior to the survey, while 62 percent had sent or brought goods. A substantial number of the permanent migrants were students and other economically inactive persons who were unable to remit money. If they are excluded, some 95 percent of permanent migrants in the urban workforce remitted money to their parents in the year prior to the survey. In addition to regular remitting to their families of origin, migrants in the city are occasionally called upon in emergencies to help their wider families (*golongan*).

The flow of remittances between village and city initiated by permanent and long-term rural-to-urban migration is not one-way. In West Java the costs incurred by circular migrants and commuters for travel, and for survival in the city before a job was found, were much less than those incurred by permanent migrants and were quickly compensated for by earnings in the city. However, possibly in part because of the higher initial costs incurred by permanent migrants, 21 percent of those surveyed in West Javan cities reported having received regular remittances from their village families. Most recipients of cash were students whose tuition and living costs were met by their parents. Lipton (1980:13) reports that in India the level of out-remittances from a village is strongly related to the number of student out-migrants. A common practice in West Java is for migrants returning from a village visit to bring substantial amounts of agricultural produce (especially rice and other foodstuffs) in with them. Some investigators have argued that these out-remittances from villages are generally greater in value than remittances received from the city (Amin, 1974; Lipton, 1977; Simmons et al., 1977; Connell et al., 1976), but this was not the case in the West Java study or in many recent careful village studies. Oberai and Singh (1980:235), for example, found in their study of 2,124 households in the Indian Punjab that the volume of remittances to out-migrants was negligible when compared with the in-flow of remittances from them.

The sharing of wealth between movers and those who remain in the village of origin is the result of a complex pattern of social and economic obligations that are usually family based and are not necessarily broken or weakened because family members are dispersed. An interrelationship clearly exists between the attitudes of family members (especially the head) toward out-movement from the village and the family's need for, and expectations of, remittances; but this determinant of population mobility has not been addressed to any great extent in the literature.

A critical factor in all of the above is the extent to which the village-based family (especially the parents) can establish and maintain control over members who are spatially separated from them so that net wealth transfers from children to parents are maintained. Within the village community there are usually various traditional mechanisms for exercising this control. In West Java, for example, village communities are characterized by complex patterns of reciprocal obligations and ties between and within families and generations, along which wealth flows are channeled. These relationships and flows are regulated by *adat*—the body of customary practice—which varies from area to area but has some common elements. *Adat* regulates and provides guidelines for most day-to-day activities in the village, including wealth transfers.

One important set of ties is associated with the family; these ties are particularly strong in West Java. The closest links are within the *keluarga batih* (nuclear family consisting of husband, wife, and unmarried children[3]), but ties are also maintained with a wider kindred group (*golongan*). Between the *keluarga batih* and the *golongan* exist strong mutual obligations. Loyalty to family is one of the most fundamental characteristics of the Sundanese inhabitants of West Java. It distinguishes them somewhat from the Javanese, whose local loyalties seem more territorial in nature. The strength of Sundanese family ties is encapsulated in a frequently heard Sundanese proverb (which, incidentally, has its equivalent in proverbs of several other ethnic groups:[4] "*Bengkung ngariung bongkok ngaronyok, kacai jadi saleuwi kedarat jade salongah*" ("So long as the family is together everything is good, no matter what the economic circumstances"). The Sundanese feel loyalty and ties to their *kampung halaman, kampung keluarga,* or *tanah kelahiran*—the section of the village in which they were born, where their family lives and has lived for a long time. They do not have strong ties with the locality as such, but rather indirectly through its role as the traditional home of the family. I know of no studies that have attempted to measure the wealth flows that are channeled along the strong ties between members of the *keluarga batih.* It is clear from field observation, however, as well as from anthropological work among the Sundanese (e.g., Palmer, 1959, 1967; Harsojo, 1971), that the flows are substantial and the obligation to see to the welfare of parents and other members of the *keluarga batih* is strongly perceived and reinforced by *adat* (customary law). Net intergenerational wealth flows, at least among the poor and middle-income landless and small holding groups, are very much in favor of parents. Although the Sundanese feel an obligation to provide regularly for parents, they also know they can approach the wider *golongan* family for assistance in time of need. Harsojo (1971:318), for example, states that when a relative in one's *golongan* is living in another city or village, one can always beg assistance from him in time of need. There is as yet little evidence of a weakening of these obligations and ties between members of the *keluarga batih* and *golongan* with migration out of the hearth area.

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[3] Palmer (1967:314–15), however, states that the *keluarga batih* often includes other relatives and even servants, and that it is "constantly changing as relatives come to stay after sickness or economic hardship in the city, sons-in-law move in temporarily at marriage, married daughters come home to bear their children or return after divorce, and children of a child or sibling or more distant relatives join the household for a period of from days to years."

A second type of intracommunity tie that initiates wealth flows—although it is less likely to be intergenerational—is the traditional authority relationship. Palmer (1959:42–43) explains that the Sundanese have traditionally emphasized loyalty to superiors both within and outside the family. In West Java traditional authority networks known as *bapak-anak buah* relationships have long been widespread. Jackson and Moeliono (1973:18–19) explain the system thus:

> . . . the father (*bapak*) of the group accumulates authority by building what in effect is an extended family which he is able to command and for which

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[4] For example, Mantra (1981:145) reports the same proverb and close family ties among the Javanese; and Rambe (1977:29), in discussing the close family ties among the Banjarese, quotes the following popular proverb: "Although it may rain gold in another country and stones in our area, we will still live in our village of birth" (my translation).

> he must assume diffuse responsibilities. The *bapak* forms relations with his *anak buah* (children) by assuming responsibility for their spiritual, material and social needs.

Thus there may be flows of wealth from *bapak* to *anak buah* involving provision of access to agricultural land or employment as a sharecropper or wage laborer, providing the offspring with money, food, etc., during unpredictable calamities such as drought, providing money for ceremonies, to pay off money lenders, and for other special needs. In return, the *anak buah* may repay the debts incurred but the main debt owed the *bapak* is a moral obligation (*hutang budi*). The benefits to the *bapak* are hence not necessarily or even usually financial but are associated with increased status in the village. The extent to which these flows are intergenerational and interfamily has not been explicitly investigated, but intragenerational flows seem to be dominant.

The final set of intravillage linkages involving wealth flows in West Java is that usually referred to as *gotong rojong*—the concepts and practices related to mutual assistance and cooperation felt within groups of people in the village. Hofsteede (1971:55) explains that its two basic principles are reciprocity and equality; it is a system for mobilizing local resources to sustain poor families in time of economic stress and in expediting such tasks as harvesting and road construction, and it has a strong socio-psychological supportive role.

These are the major types of obligations and linkages within West Javan village communities along which wealth flows occur. They have been little studied and their wealth-flows aspect totally neglected. Nevertheless, it is apparent that such flows are substantial and also that most of them are maintained after migration occurs. In West Java however, as in many other Third World regions mentioned in this review, the high level of population movement out of villages is a recent phenomenon. Most movers are thus very close to their village origins, so that the strain placed on village-based obligations and ties by the mover's absence presumably is not so great as when the mover has been separated from the village for many years. Field evidence suggests that remittances from permanent migrants tend to fall off sharply over time (Connell, 1981). Among temporary migrants of various types, however, the constant movement to and from the home place usually serves to reinforce the traditional ties and bonds between mover and village-based family. Hence, as long as temporary migration remains dominant, it is likely that the net intergenerational wealth transfers in favor of parents will be maintained.

Some writers (e.g., Skeldon, 1977; Maude, 1980; Nelson, 1978) have suggested that this temporary migration represents a transitionary phase and that with further economic and social change mobility will gradually become more permanent in nature. It is perhaps too early to judge whether such an evolutionary sequence will occur in West Java, but at least at present temporary movers appear to have a strong long-term commitment to a bilocality that combines activity in both urban and rural areas. Should much of the circular migration and commuting be transformed into permanent migration, it would certainly result in a reduction in wealth flows to village-based families.

THE PREVALENCE OF REMITTANCES

Connell et al. (1976:91) suggest that there is a steady decline in both the absolute size of remittances and the proportion they make up of migrant earnings as one moves from international to townward to rural-rural migration. In this paper I have argued that it is less the nature of the destination than the commitment of the mover to the destination and the resultant degree of permanence of the move that influences wealth flows. Rempel and Lobdell (1978:333) conclude from their review of the literature that "the proportion of urban income remitted varies directly with the strength of social and economic ties to the rural area, and inversely with how well migrants are established in urban areas." Many of the case studies from Africa, India, the Pacific, and Southeast Asia indicate that, in comparison with income earned, the proportion of money and resources remitted is substantial.

In my West Java study (Hugo, 1978:265) all temporary migrants brought back money to the village when they returned, 81 percent brought back goods, and 74 percent sent money back to the village between their return visits. Overall in the survey villages remittances from circular migrants averaged one every six weeks. Among circular migrants from villages in Jakarta an average of 57 percent of weekly incomes was spent on urban-based living expenses, 11 percent on travel to and from the village, and 32 percent on remittances to the village. The average weekly earnings of these movers were very low (around US $6.00 at the time of survey in 1973) both in absolute terms and relative to earnings of permanent Jakarta residents (estimated in 1972 to be around US $9.50 per week [Papanek, 1975]). Most circular migrants endure absolutely minimal living conditions in the city in order to maximize the amount remitted and the frequency with which they can return to the village. Among migrants from the 14 villages studied, the proportion of Jakarta-earned income remitted ranged from 21 to 44 percent, the highest rates being among those earning higher average incomes.

Among permanent migrants in Jakarta, remittances accounted for 10 percent of their total urban incomes on average. Although these remittance rates were lower than those of temporary migrants, the finding that the incomes of permanent migrants tended to be both greater and more secure means that this level of remittance represented a substantial flow to the villages. The proportion is especially impressive when it is considered that the bulk of the flow is directed toward relatives other than the family of procreation.

It is perhaps more meaningful to examine the importance of remittances in the migrant's place of origin. In West Java I observed a close relationship between the type of mobility (commuting, short-term circular migration, or permanent migration) and the relative importance of remittances from the mover in the total income of the household of origin. Table 2 shows that remittances have the greatest relative importance in commuter households, making up 60 percent on average of their total income. This is because there is little seasonal or daily fluctuation in rates of rural-urban commuting and most commuters are employed more or less full time in urban areas. Circular migration is more subject to seasonal fluctuations than commuting, so that urban participation is more intermittent and on average the contribution of remittances to village household income is smaller. But remittances from circular migrants in urban areas still account for nearly half of the total income in their households of origin. Four-fifths of the remittances involve cash flows. Noncash remittances are a frequently overlooked economic benefit accruing to villages as a result of migration, but in West Java their average value in the year before the survey was rupiah (Rp) 12,200 per circular migrant whereas average cash remittances were Rp 49,700. (One Rp was equal to US $0.042 at the time of the survey.) The overall predominance of cash remittances from circular migrants, however, points to the main function of urban income in the village: to permit the purchase, at lower

TABLE 2. Contribution of remittances from commuters, circular migrants, and permanent migrants in urban areas to the income of their households of origin in West Javan survey villages: July 1972 to June 1973
(In thousands of rupiah)

Item	Commuters	Circular migrants	Permanent migrants
Number of respondents	193	463	411
Household income			
Mean	184.4	129.9	171.9
Intervillage range	72–354	83–239	102–272
Remittances received			
Mean	111	61.9	13.7
Intervillage range	25–145	27–88	8–20
Remittances as % of household income			
Mean	60.2	47.7	8.0
Intervillage range	24–91	16–69	4–14

NOTE: US $1 = Rp 420 at time of survey. Households may have included one or more movers.

SOURCE: Hugo (1978:268–72).

prices than in the city, of the basic necessities of life, such as food and clothing. In the poorer villages I studied higher proportions of remittances consisted of cash than of goods. In the poorest villages remittances also accounted for the largest proportions of household income. In fact, there was a significant inverse relationship (Rho = −0.69) between the average annual income of mover households and the proportion of the income that was made up of remittances.

Table 2 supports the hypothesis that village households sending permanent migrants to urban areas have substantially higher average annual incomes than those sending circular migrants. But in West Java the contribution of permanent migrants' remittances to village income was only one-sixth that of circular migrants. A major reason is that nearly half of the permanent migrants were not in the workforce and had no income to remit. Even among households with working permanent migrants in the city, however, the average proportion of income consisting of remittances was only one-third that of circular migrants. Nevertheless, when one considers that, unlike circular migrants, many permanent migrants support their family of procreation in the city, the sums remitted to the villages are substantial. A larger proportion of permanent migrants' remittances (50 percent) consisted of goods and gifts than was the case for remittances from circular migrants (20 percent). An inverse relationship (Rho = −0.71) existed between the average annual income of permanent migrants' households of origin and the proportion of that income consisting of remittances. Hence, as with village households of circular migrants, among those of permanent migrants it was the poorer ones that relied most upon remittances for survival.

Unfortunately, few migration studies in Indonesia have collected detailed remittance data, and therefore it is difficult to judge the extent to which the findings of the West Java study can be generalized. Jellinek (1978) found that the circular migrant traders she interviewed in Jakarta were usually able to set aside up to half of their earnings to send back to their villages. She comments thus concerning the effect of the remittances in the villages:

> . . . for those villages which do send circular migrants to the city, the financial impact may be quite significant, even when only a small proportion of the menfolk take part. This becomes evident when one compares the annual grant made by the Indonesian government to the villages for development purposes with the amount of money taken back to the village by just one circular migrant. In 1975 the so-called Inpres grant to every village amounted to Rp 200,000 per annum. . . . One ice-cream seller of middling ability could send back more than half this amount to his village each year. In villages with not one but fifty or more circular migrants, the amount of money brought back to the village must have been much more substantial than any other source of village income (Jellinek, 1978:7–8).

Critchfield's (1970) study of a Jakarta pedicab driver also details the importance of remittances from the city to the rural home area. Suharso et al. (1976) found that one in six migrants in Indonesian cities remitted money to their villages; excluding student migrants, the proportion was one in four. Naim (1974) reported that migrants from West Sumatra not only sent remittances to their village families but also formed themselves into associations at their places of destination and sent funds to their home villages for village development projects. He explained that it is widely acknowledged among migrants all over Indonesia that it is their duty to "help sustain things going on in the village" (Naim, 1974:304). He found the wealth flows from migrants to their village-based families to be considerable, with much of the money being sent expressly to support parents (Naim, 1974: 309). Naim has suggested (p. 309) that part of the long-established tradition of *merantau* (out-migration) from West Sumatra is that migrants leave "always with the idea of bringing home everything they earned in *rantau*" (the destination). This tradition, however, has undergone some modification since Maude (1975) found in his study of 11 West Sumatran villages that the proportion of households in those villages that relied to any extent on remittances for household income ranged from 0 to 73 percent.

Naim (1974:315) has also raised the issue of ethnic differences in the propensity to remit. Whereas there is a strong tradition for, and obligation upon, West Sumatran migrants to send money back to their natal village, this does not apply to most Batak people in North Sumatra. Similarly, Siegel (1969:166), in a study of the Acehnese in the northernmost province in Sumatra, reported that

> they [the Acehnese] ridicule the Minangkabau for sending money back to their villages when they could use it for trade. The Minangkabau, said one trader, "are outmoded. They send money home instead of keeping it for business."

In South Sulawesi Forbes (1978:229) found that one-third of the Makassarese trishaw drivers he interviewed in Ujung Pandang sent money back to their home villages, usually to wives and parents and on a monthly basis. According to Mangunrai (1979), Torajan migrants from the mountainous interior of the province remit money home from their destinations, especially the city of Ujung Pandang. Crystal (1974:133) and Forbes (1976:8–9) have indicated that these remittances are an important element in agricultural development in the home village. The money sent back to families is used for four main purposes–to purchase rice fields, to buy buffalo and pigs, to construct elaborate and ornate wooden houses, and for ceremonial use. Rumbiak (1978:57), in his study of the migration of Genyem people in Irian Jaya to the provincial capital of Jayapura, found that most migrants remitted money to their home villages, the bulk of remittances going to families of origin. He emphasized the influence of customary law (*adat*) on the level of remittances. *Adat* in this area makes it imperative that a migrant send remittances to the home village; not to do so when one arrives at the destination is to defy *adat* and could lead to social sanctions against the migrant.

A question having an important bearing on the topic of this paper is: Who in the village receives and has control over the remittances sent back by movers? Unfortunately, most studies do not include a detailed analysis of the relationship between the recipients of remittances and the sender. In my West Java study some four-fifths of temporary movers' remittances were sent to the nuclear family of procreation for its maintenance, since almost all such movers had left their wives and children in the village. Nevertheless, one-fifth of the remittances from these movers were remitted to parents and thus represented a substantial upward intergenerational wealth flow. Such intergenerational transfers were predominant in the flows from permanent migrants to their villages of origin.

Similar patterns of dominant child-to-parent flows have been reported in much of the African literature. Riddell (1970:68) found in his Liberian study that in 132 circular labor migration trips recorded, migrants made 100 cash transactions with members of their families, 60 percent of the transactions involving the father, 30 percent wives, and 10 percent other kin or a combination of the first two. Knowles and Anker (1977:4–7) concluded in their study of remittances in Kenya that, although the average amount transferred was greatest for transfers involving members of the mover's own nuclear family (i.e., wives, sons, and daughters), there was evidence that children were an important source of support for parents. Their analysis, which was based on the de jure "economic household" discussed earlier, indicated that, of the transfers sent by household heads, the proportions received by their parents were 21.2 percent in the case of migrant heads resident in urban areas and 33.6 percent from heads residing in rural localities. In addition, among sons and daughters in these "economic households," parents accounted for 48.9 percent of remittances sent from urban areas and 30.3 percent of those sent from rural areas.

In the Indian literature, the study by Oberai and Singh (1980) in the Punjab shows that upward intergenerational wealth flows were dominant among 395 of a total of 697 out-migrants they studied who had ever remitted (p. 231). In fact, nearly three-quarters of all remittances were directed toward the parents or parents-in-law of migrants. Kothari (1980:289) reported that in Rajasthan 97 percent of households from which migrants had left received remittances, so that every second household in the sample villages had a double source of income—from family members working in the village and from those of its members who worked outside the village. Kothari found that the remittances were usually sent to the father or wife of the mover.

To sum up the prevalence of remittances, it is clear that in many parts of the Third World in-remittances constitute a major element in village income. These remittances are directed predominantly toward the family of procreation and the family of origin. Remittances to the latter are particularly meaningful because they involve, in Caldwell's (1976) terms, a cross-generational net upward flow of wealth from children to parents. Whether such patterns support high stable fertility levels in areas of out-migration is not clear from the literature, although Mamdani (1972:44) maintains that they do in India. The West Javan areas most influenced by population movement to Jakarta appear to have above-average fertility for Java.[5]

THE USE OF REMITTANCES

One aspect of the controversy in the migration literature over whether the impact of out-migration on rural areas is beneficial or harmful concerns the extent to which in-remittances are used for productive purposes in the village. Connell et al. (1976:98) concluded in their review of studies from Africa, India, and the Pacific that

> the overwhelming weight of evidence suggests that the spending of remittances reflects the poverty and lack of investment opportunities from which the migrant came. The majority of remittances are consumed in everyday household needs, or in conspicuous consumption.

This generalization was borne out in the West Javan study villages, where most remittances from temporary migrants were used to purchase the mundane necessities of life. The pattern was slightly different with remittances from longer-term and permanent migrants, however; only one-half (54 percent) of the recipients of such remittances used the monies to purchase rice (the staple food of the region), although a considerably larger proportion (84 percent) bought other types of food.[6] Over half (56 percent) of households receiving remittances from permanent movers met educational expenses of siblings and children with remittance funds. This finding again suggests that permanent migrants tend to be drawn from the more prosperous households. Other nonsubsistence expenditures involved the mounting of ceremonies, especially those associated with life-cycle events such as circumcision and marriage (20 percent of recipients), whereas nearly half (49 percent) of recipient households purchased consumer goods such as pressure lanterns and radios. Only 6 percent of migrants' families of origin made use of remittances for development investment in land, property, or agriculture, although many of the migrants made such investments themselves. Out-remittances of money to permanent migrants in cities were almost entirely devoted to meeting the costs of putting children through educational institutions (Hugo, 1978:274).

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[5] Unfortunately, detailed fertility data were not collected as part of the 1973 West Javan survey (Hugo, 1975, 1978), but the survey data and birth registration data indicated that the villages with high rates of temporary out-migration had high fertility levels. Moreover, detailed analyses of Java's fertility done at about the same time as the field survey showed much higher fertility in West Java than elsewhere in Java and Bali. For example, McDonald et al. (1976:5) found that parity among women of ages 40–44 in 1973 was 1.5 children higher on average in West than in East Java. It is an interesting but unanswered research question whether the higher rates of temporary migration to cities in West Java are associated with the sharp regional fertility differentials.

Thus the evidence from West Java indicates that, especially in the poorer villages and households, most of the remittance income is used to purchase basic necessities such as food staples and that the purpose of population mobility for many is to help bridge the gap between *cukupan* (having enough)[7] and the income-earning possibilities in the home area. It was only in the more prosperous villages and households I studied that remittances were being used to buy nonsubsistence goods and education. It was thus critical to the welfare of many rural households that the remittances continue and access to urban employment be maintained.

These findings are supported by Jellinek's (1978) urban-end study. "The bulk of the *pondok* dweller's savings, perhaps as much as seventy per cent, went on the basic food needs of his family in the village" (Jellinek, 1978:6).

Oberai and Singh (1980:236–37) reported similar findings from their Punjab study: that three-quarters of households spent remittances on food and clothing; a quarter spent them on consumer goods; 10 percent used remittances for ceremonies; and only a small proportion (6 percent) used remittances for productive investment such as the purchase of agricultural equipment, land, seeds, fertilizers, and pesticides. Oberai and Singh make the point, however, that although the overall pattern of expenditure appears to be consumption-oriented, it should not be viewed as being unproductive since, in an economy in which levels of living are low, consumption expenditure may be functional and induce significant improvements in labor productivity.

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[6] These data on remittance use are extremely limited. In practice the remittances may have freed for other purposes funds that would otherwise have been committed to the purchase of food. To investigate this question more fully one would have to compare consumption patterns of remittance recipients and nonrecipients or those of a household before and after the introduction of remittances.

[7] This Indonesian term is widely used in Java to refer to how much income in rice equivalent is necessary for an individual to survive at a bare subsistence level.

In a study in Southeastern Nigeria, Odimuko and Riddell (1979) found that 71.3 percent of sample households received remittances. A multiple regression analysis revealed that cash remittances had no apparent effect upon the general maintenance of rural households or upon expenditures on primary school education, but they were associated significantly with spending on secondary schooling. Odimuko and Riddell asserted that because the latter type of expenditure is closely related to rural youth out-migration it contributes to a continuation of existing rural-urban disparities.

Expenditure of in-remittances on education of children and siblings is a widespread practice (see, e.g., Corner, 1981:132); but in many cases, such as the West Javan villages, out-remittances for education are probably so large that the net wealth flows directly used to finance education are probably in a rural-to-urban direction. Such out-remittances, however, are seen in some contexts as a form of investment because education will assist children to obtain well-paid, urban-based occupations and enable them to remit money and goods to their families. For example, Knowles and Anker (1977:41) observed in Kenya a positive relationship between educational level and transfer level. They suggested that this finding is consistent with the use of income transfers to repay parents and other relatives for past educational expenses. Hence, a net wealth flow from village-based parents to an urban-based child will be balanced and perhaps even outweighed by a net flow in the reverse direction at a later stage in the life cycle.

That the bulk of remittances to the village are used for food, clothing, and other necessities is partly a reflection of the predominant causes of the migration itself—to maintain and perhaps enhance the welfare of the village-based family of procreation or family of origin. This is particularly so in Java, where many peasant and landless households live close to the margin of subsistence. Several intravillage support systems involve wealth flows within and between families to ensure survival. These flows are governed by customary local practice (*adat*), which specifies not only mutual obligations between members of the nuclear family (*keluarga batih*) and the wider family (*golangan*), and between patron (*bapak*) and client (*anak buah*), but also mutual self-help among residents of a particular community (*gotong royong*). The resultant relationships and obligations act as a social insurance system in times of difficulty. *Adat* thus fosters some redistribution of village resources, but since the redistribution is directed toward the survival of poorer and disadvantaged groups rather than their upward mobility, the entrenched pattern of intravillage inequality is preserved. When these mutual obligations are extended through remittances beyond the village to resources located in towns, it is not surprising that the basic necessities predominate among remittance expenditures. In Java little is known about the extent to which migrants are maintaining traditional obligations and relationships or whether increased commercialization of agricultural activity is eroding the "shared poverty" aspects of *adat* within the village and hence encouraging greater out-migration among the poor.

The weight of evidence suggests that remittances are seldom used as investment for rural development. Investment tends to be restricted to construction and improvement of village houses, purchase of land, and education. Mitchell (1969:179) concludes in his study of labor migration in Africa that the mover faces a lifetime of family obligations in his home area and strives to conserve the existing situation in that area rather than attempt to transform its economy or social structure. The rural alternative is maintained in part by wealth flows, many of them intergenerational in an upward direction and essentially conservative of the village status quo in their effect. Thus migration in much of the Third World supports pretransitional wealth-flow patterns—that is, patterns characteristic of societies that have not yet experienced fertility decline.

INCOME-DISTRIBUTION EFFECTS OF REMITTANCES

It is somewhat surprising that in the substantial literature concerned with remittances there are few explicit or detailed analyses of their effects upon income distribution. Much of the importance, from a policy point of view, of migration-related wealth transfers stems from their potentially significant role in the redistribution of income both spatially within a country and socially between classes. For example, Knowles and Anker (1977:1) note the possibility that an increased propensity to remit income to home areas among rural-to-urban migrants may have an income-redistributing effect similar to that of policies designed to spread employment opportunities more widely.

The first income-distribution issue to be addressed here is that regarding spatial inequalities of income distribution. Amin (1974:99–105) has argued that in West Africa migration exacerbates regional inequalities, especially urban-rural inequalities, since not only are the net gains of remittances in rural areas negligible (or perhaps even negative) but also the loss of a workforce badly affects accumulation of capital and agricultural production in the home region.

Resolution of the issue of the redistributive effect of migration within Indonesia must await more detailed studies. But existing studies in Java and many parts of the Outer Islands of Indonesia indicate that when both temporary and permanent migrants are considered, the net flow of remittances tends to favor the village, that the seasonal or periodic loss of labor from the village rarely results in loss of overall village productivity, and that many individuals and village communities would be in dire circumstances should their access to income-earning opportunities in cities and other centers of investment be curtailed.[8] On a larger scale involving consideration of all flows of goods and money between the rural and urban sectors, such as tax collection, the purchase of agricultural products in urban areas at government-regulated low prices, and other modes of extraction of rural-generated surpluses for investment in urban areas, it may be that the city's relationship to the village is parasitic. The evidence regarding the influence of population movement, however, especially temporary movement, on remittances and rural productivity is that such movement is producing a net gain in the areas of origin. Hence, in the absence of any other changes, if migration were to cease the village and the villagers would be worse off.

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[8] These of course are generalizations and one can point to exceptions. In one West Javan village I surveyed (1975, 1978) agricultural productivity had declined as a result of excessive out-migration. Moreover, out-movement tends to occur among the more innovative individuals who have leadership potential. In some cases out-migration has been a means of maintaining the rural status quo because potential leaders who would otherwise press for change in the village are lost to the community. Lineton (1975:193), for example, says that out-migration from parts of South Sulawesi has this "safety valve" function.

De Koninck (1979) has made an additional point that should be considered in examining the effect of remittances on rural-urban income distribution: that even if the net flow of remittances favors rural areas, it acts as one component in the commercialization and general penetration of money into the rural economy. According to him, this in turn will encourage increased local expenditure on consumer goods produced outside the rural economy (and often outside the country) and in so doing expose villagers to the possibility of exploitation by urban and foreign producers. This development may ultimately produce a balance of income distribution favoring urban areas rather than rural areas.

One of the few detailed studies of income transfers between regions was that undertaken in Kenya by Knowles and Anker (1977:7). They found that urban-to-rural transfers, while comprising only 37 percent of all recorded transfers, accounted for 50.4 percent of all income transferred, whereas rural-to-urban transfers constituted only 6.5 percent of all transfers and 6.3 percent of all income transferred. Rural-to-rural transfers comprised the largest proportion (46.3 percent of all transfers), reflecting the scale of this type of movement; but because of low rural incomes they accounted for only 28.4 percent of total income transferred. Moreover, the pretransfer Gini coefficient of income inequality for rural and urban households combined (0.672) was reduced to 0.664 when transfers were included. Knowles and Anker concluded that transfers result in a redistribution of income from high-income urban areas to lower-income rural areas and a reduction in the overall degree of inequality.

Oberai (1975) reported migration into Khartoum to have beneficial income-distribution effects. Fraenkel et al. (1975) found migration likely to worsen income inequalities in urban Brazil, but Yap (1976) found that migration improved distribution in Brazil as a whole. Stark (1976) and Gaude (1976) discussed a range of empirical studies that tend to find migration beneficial to income distribution. Hence the role of population mobility and remittances in exacerbating, ameliorating, or preserving spatial inequalities is as yet unclear; but it is certain that, as Rodgers (1977:19) has pointed out, ". . . such mobility as occurs is not sufficient to eliminate the major inter-sectoral and inter-regional wage differentials which characterize dualistic economies."

It is apparent that certain individuals and groups in the villages of origin do benefit substantially from remittances. As Connell (1981:

250) has stated, ". . . unequal access to migration opportunities inevitably mean[s] that the costs and benefits of migration are also unevenly distributed." Because of this unequal access to population mobility and differential propensity and ability to remit there will be substantial intervillage and intravillage variations in the effects of inremittances at the place of origin. Lipton (1980:4) found that two main groups tend to migrate from villages. The first consists of deficit farmers and landless laborers (although seldom the very poorest, who cannot afford the initial cost of movement); they are "pushed" out. The second consists of the children of bigger farmers, who are "pulled" out by the lure of education and prestigious nonagricultural occupations. It is important to realize that not all households in receipt of remittances are among the poorest in a village. Several studies (cited in Connell et al., 1976:95) have indicated that more prosperous households receive substantial remittances and that the poorest and neediest households may miss out completely on this source of income. But the evidence is mixed concerning whether the remittances that migrants send back to the village change income distribution at the place of origin.

Lipton (1980:3) states unequivocably that ". . . migrant streams are so structured that—contrary to the expectations of marginal analysis—their movement worsens overall distribution among remaining rural persons, among remaining rural persons plus migrants and between village and town." Lipton's (1980:11) argument that remittances do not foster intrarural or rural-urban equalization is as follows:

> First, total net remittances are very small compared with rural income in the great majority of villages, indeed they are often negative. Second, positive remittances go disproportionately to the better off; *townward* migrants, especially the remitters and above all the international remitters who send back really big sums, are seldom from the poorest village groups.

Similarly, Connell (1981:250) concludes that migration occurs because of inequality and it serves to emphasize and establish that inequality directly and indirectly. Both Lipton and Connell marshall evidence from field studies to support their view. However, examination of the literature indicates that the relationship between remittances and economic inequality is not a simple one.

One of the few studies to test explicitly the effect of remittances on village income distribution is that by Oberai and Singh (1980) in the Punjab. They found (p. 239) not only that remittances raised the average income of out-migrant households by 31 percent but also that the Gini coefficient of income distribution fell by 17 percent (from 0.515 to 0.43) when remittances were considered as part of household income. Their findings confirm those of several other studies, in which the relative effect of remittances proved to be much greater on poorer than on better-off households. They also found that when all households in their survey were included in the analysis there was a decline in the Gini coefficient. The finding led them to conclude that remittances improve not only the distribution of income among out-migrant households but also the overall distribution of income in rural areas.

Knowles and Anker's (1977) study of Kenya provides a detailed analysis of the effect of income transfers on the size distribution of household incomes. Among rural households they found that the absolute level of transfers increased with income but that net transfers fell as a proportion of total income as income rose. They also observed a small drop in the Gini measure of income inequality (from 0.657 to 0.651) when transfers were added to income. Kothari (1980: 253) found in Rajasthan that migrant households received an average of 24 percent of their annual income from remittances, but that even if those transfers were not considered their income levels tended to be higher than those of nonmigrant households.

In Indonesia there has been little investigation of the income-redistribution effects of remittances. In my West Java study I found a consistent tendency for households with movers to have higher incomes than households without movers (stayers), and this difference was statistically significant. Table 3 shows that the differences were greatest among households with movers who were commuters or permanent migrants and least among those with circular migrants. Table 3 also indicates that it was remittances that made the incomes of temporary mover households higher than those of stayer households, whereas the incomes of households sending permanent migrants were substantially higher even when remittance income was excluded. One point of note is that circular migrants tended to be drawn from poorer households than either commuters or permanent migrants, and it is almost certain that the remittances associated with temporary migration had a more positive effect on income distribution within the village than those of permanent movers.

Thus the evidence regarding the effects on income distribution of

TABLE 3. Average annual incomes, excluding and including remittances, of mover and stayer households: West Javan survey villages, July 1972 to June 1973
(In thousands of rupiah)

Household type	Income Excluding remittances	Including remittances
Stayer	87.3	87.3
Mover		
Commuter	73.4	184.4
Circular migrant	68.0	129.9
Permanent migrant	158.2	171.9

NOTE: US $1 = Rp 420 at time of survey.
SOURCE: Hugo (1978:268–83).

population mobility and migration, and more particularly the effects of the remittances they generate, is, as Rodgers (1977:30) explains, scattered and inconclusive. On the one hand there is some empirical evidence to support the a priori hypothesis that mobility reduces inequality, while on the other there is a body of evidence that suggests that mobility preserves or even increases inequality. Much of the inconclusiveness is due to the small number of detailed studies focusing on the impact of remittances from all forms of mobility upon income distribution. New studies should focus not only upon the short-term effects of migration and remittances but also upon their longer-term implications for income distribution. It may well be that the short-term effects are largely beneficial to rural areas, whereas the longer-term effects are detrimental. Any discussion of the desirability or undesirability of particular migration-related policies should be informed by a knowledge of both the short-term and the long-term effects of remittances on rural incomes and welfare, as well as on income distribution within rural areas and between urban and rural areas.

POPULATION MOBILITY AND THE FERTILITY TRANSITION

One of the basic propositions of Caldwell's reformulation of demographic transition theory is that the direction of net lifetime intergenerational wealth transfers is determined by the social structure of a community, especially as the theory relates to the family and the nature of the relationships between family members. Caldwell (1976) argues that the primary force in the reversal of the direction of net intergenerational wealth flows is changes in the traditional system of family relationships involving a shift from an extended family, in which one's primary responsibilities and relationships are toward one's parents, to one that is economically and emotionally nucleated and in which relationships with one's spouse and children assume much greater significance. Caldwell suggests that in the West these changes in family structure were caused by a social revolution encompassing various developments, one of them being the introduction of compulsory mass schooling. He argues that a major cause of the initiation of fertility decline in the Third World has been the importation of European concepts of family relationships and obligations, and that from a demographic viewpoint the most important "social exports" from Europe have been the predominance of the nuclear family (especially strong husband-wife ties) and the concentration of concern and expenditure on one's children rather than on one's parents. The major vehicles of this importation, according to Caldwell, have been mass education and the mass media. One can also argue that population mobility is playing a major role in initiating this social change.

In the migration literature there have been a preoccupation with the economic changes brought about by population movement and a reluctance to examine the social and attitudinal effects of migration upon movers. Third World migration studies have exploded the myth that movement from village to city in itself deterministically effects major changes in the demographic, economic, and social behavior of individuals, transforming them into "modern" men and women (see, e.g., McGee, 1971; Abu Lughod, 1969; Perlman, 1973; Hugo, 1978: 200). Nevertheless, many movers are subjected to nontraditional influences as a direct result of their mobility. Although institutions associated with the family and community of origin usually cushion the impact of movement, most movers come into regular contact with nontraditional influences in working and living at their destination. Few studies have probed the extent to which this exposure has modified behavior, especially behavior relating to parent-child and conjugal relationships, and resulted in a challenge to the pattern of a net upward flow of wealth. This challenge is more likely to come from permanent than from circular migrants. Few empirical data are available, however, regarding the interactive role of population mobility, fertility, and intrafamily wealth transfers and the extent to which it differs according to the type of mobility and the duration of absence of the mover. Although research on the fertility of migrants is very limited (Findley, 1977:66), there is evidence that the social factors that contribute to lower fertility among native urban women than among their rural counterparts can also affect migrant women in urban areas. In her literature review Findley (1977:66) lists several factors that appear to have this effect, including increased educational participation and attainment, increased workforce participation and commitment to work, greater participation in family decision-making processes, access to improved health care and family planning services, greater "modernism," and the increased level of family income.

Although many more or less permanent migrants maintain major commitments to their village of origin and even intend to return to it at some stage, a common finding is that over a long period the amount and regularity of remittances tend to decline (Connell et al., 1976). In several contexts a "drift towards individualism" over time has been noted among movers (Connell 1981:248). The drift manifests itself not only in a reduced proportion of income being remitted to the home area but also in more of those remittances being used to benefit the mover (e.g., for purchase of land or the building of a house) rather than to benefit the mover's parents.

Caldwell (1979:iii) has stated that migration "inevitably causes social changes" of the type that work toward a reversal in the direction of net intergenerational wealth flows. More research is needed that explicitly investigates and specifies the types of conditions under which population mobility initiates such social change.

CONCLUSION

This paper has attempted to examine the significance of population mobility in transferring wealth within families in Third World societies. The discussion is hampered by a paucity of studies on this subject and also by the fact that most of the existing studies fail not only to detect most of the remittances that flow between movers and their families of origin but also to detect many of the moves that initiate wealth flows. The incompleteness of the studies' data, which have been used widely (and with apparent confidence in their accuracy), must make somewhat tentative most generalizations regarding the scale, determinants, and significance of wealth flows initiated by population mobility. Nevertheless, it is clear that the flows associated with temporary moves tend to be greater not only in absolute amounts but also relative to the total income of both mover and family of origin. The growing importance of such movement in Southeast Asia (Goldstein, 1978) and elsewhere, and the fact that most conventional migration studies exclude this type of mobility, indicate a need for more information concerning the significance of the wealth flows associated with it. This paper has attempted to demonstrate that much of the population mobility initiated in Third World countries is oriented to the family rather than the individual, and that this family orientation contributes substantially to the flow of remittances, since the desire to increase wealth flows to parents, wife, children, and other relatives is frequently the reason for mobility in the first place. The large volume and impact of these flows and their importance to the livelihood of village families has been demonstrated in the paper with reference to data from West Java and several other regions.

Although our present limited understanding and knowledge of the linkages between population movement, wealth transfers, and fertility render any attempt at generalization somewhat presumptuous, a few propositions can be tentatively advanced. First, it would appear that the onset of high levels of population mobility, especially of temporary movement, supports the maintenance of stable high fertility in pretransitional societies. The reason is that mobility permits the family to extend the geographical area over which its members can search for work, the proceeds of which are channeled via traditional linkages back to the family to ensure a pattern of lifetime net intergenerational wealth flows favoring parents over children. The critical point here is that parents are no longer restricted to examining the income-producing opportunities in the local area when deciding upon the size of their family. Second, it would appear that in many cases this strategy to maintain and even enhance wealth transfers from children to parents contains the seeds of its own destruction. Spatial mobility may initiate changes within the movers that weaken the village-based family's control over the use to which the income earned by the movers is put. Population movement, especially that of a more permanent nature, frequently involves exposure of the movers to nontraditional influences that may produce in them a greater individualism, a greater loyalty to the nuclear than to the extended family, and ultimately a challenge to the upward flow of wealth. Such social changes are conducive to a reversal of the net intergenerational wealth flow. Third, in the longer term it appears that population movement may hasten the transition from stable high fertility to a pattern of fertility decline. The extent to which this occurs will depend upon the nature and extent of the movers' commitment to their places of origin and destination, the degree of control that the village-based family can maintain over them, and the sanctions the family can bring to bear upon movers. It would appear that in many cases family control tends to decrease as the degree of permanency of the move and the mover's duration of absence increase.

Population mobility and the extent and significance of wealth flows that it generates between and within communities, classes, and generations in Third World societies is as yet little understood. New studies of migration and remittances should avoid the inadequacies of earlier research on intergenerational wealth flows cited by Caldwell (1976: 336–38). Too many remittance studies have failed to detect remittances sent and received by movers and have confined their scope to long-term migration. New studies also need to focus more clearly upon the role that remittances play within the receiving family. Studies of the effects of remittances have concentrated almost entirely upon the detection of employment-generating investment. They have overlooked the role that remittances play in maintaining net intergenerational wealth flows in the older generation's favor, with all the implications that such flows have for fertility. The extent to which population mobility does or does not initiate social changes conducive to fertility decline needs to be explicitly addressed in future research.

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Structural change and prospects for urbanization in Asian countries

Gavin W. Jones

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PREFACE

An earlier version of this paper was presented at the Conference on Urbanization and National Development in Asia, held at the East-West Population Institute in January 1982. It was substantially revised while I was a Research Fellow at the East-West Population Institute. I would like to thank both the Australian National University and the East-West Center for supporting this outside studies program. I would also like to thank the participants at the 1982 conference and the anonymous referees for valuable comments on earlier drafts of the paper.

ABSTRACT Asian countries can be divided into three groups for purposes of analyzing their urbanization prospects: the more developed, such as the Republic of Korea and Malaysia, where urbanization has proceeded quite far and the size of the rural population has begun to decline or will soon begin to decline in absolute terms; the poor, densely settled countries such as India, Bangladesh, and Indonesia, with low levels of urbanization and massively increasing rural populations; and an intermediate group of countries, including Thailand and the Philippines. For the second group of countries in particular, present development strategies imply the growth of cities to sizes beyond the range of present human experience. Though planners aim to avoid such growth, the measures used to date have not been comprehensive enough to achieve their aims.

Evidence on the relationship between the growth of nonagricultural employment and urbanization suggests that the relationship is flexible. This paper argues that the tempo of urbanization can be reduced by transformation of the employment structure in rural areas. Elements of a development strategy designed to achieve this transformation are outlined, along with their relationship to some of the urban development strategies widely canvassed in the literature.

IN RECENT YEARS, many useful studies have been published that enable us to get a better "fix" on the dimensions of urbanization in developing countries, especially from a demographic point of view (notably United Nations, 1980; Preston, 1979; Goldstein and Sly, 1975; Rogers and Williamson, 1982), and raise important issues about the role of urban growth in Asian national development in a context of rapid population growth (Davis, 1975; Pryor, 1979; Hackenberg, 1980).

Some of the key findings of the United Nations study, as summarized by Preston, may serve to put finally to rest misconceptions that proved remarkably hardy in the face of accumulating evidence to the contrary. These misconceptions included the notions that Asian urbanization was very rapid by historical standards and that policies to counter rapid city growth could be directed toward migration without an equally strong attempt to lower birth rates. Preston's summary of four key conclusions of the United Nations study might be mentioned here by way of introduction:

1. The rate of change in the proportion urban in developing countries is not exceptionally rapid by historic standards; rather, it is the growth rates of urban populations that represent an un-

precedented phenomenon–a point, incidentally, made by earlier writers such as Davis (1969, 1975) and Jones (1975).

2. Urban growth throughout most of the developing world results primarily from the natural increase of urban population.[1]
3. Among the factors that influence the growth rates of individual cities, national rates of population growth stand out as dominant in intercity comparisons.
4. Urban growth in developing countries typically has not been associated with a deterioration in the ratio of proportion of labor force in the industry sector to urban proportion of the population.

Much of the concern over urbanization in Asia has been premised on the apparent "trap" in which the Asian countries as a whole are caught. They have low levels of urbanization and far higher agricultural population densities than those in Europe at the time of the urbanization "take-off." In many parts of Asia, further expansion of the cultivated area is not possible. Further increases in rural populations, though they can without doubt be accommodated by increased multiple cropping, irrigation, and use of higher-yielding varieties, will hardly be conducive to the substantial increases in rural per capita incomes required in order to bring these countries into the group of middle-rank developing countries with modest levels of living. Yet, with a few exceptions–notably the Republic of Korea, Taiwan, and Malaysia–even rapid increases in urbanization will not prevent further increases in rural population. In the Republic of Korea, the size of the rural population began to decline in the 1965–70 period, during which it fell by more than one million. The pace of out-migration from rural areas has slowed since that time, and it is not clear whether in the 1970s it was enough to remove the entire natural increase of the rural population, currently running at about 360,000 annually (ESCAP, 1980a:21–23, 67–68). In Taiwan, the size of the agricultural population peaked in 1969 and has since been declining (Galenson, 1979:147). In Peninsular Malaysia, until 1970 the agricultural population was continuing to increase, and this was probably true of the 1970s as well. However, the level of urbanization, the rates of industrialization, and income differentials between urban areas and smallholders in the poorer states have now reached the point where the rural population could well begin to decline in size.

---

[1] The simplistic conclusion should not be drawn that the contribution of migration to urban growth over time is not extremely important, because urban natural increase is feeding on a population being swollen by migration. Take, for example, a city growing by 6 percent per annum, half of this through natural increase and half through net migration. Over a 20-year period, its population increase will be three times larger than if natural increase alone was operating; in other words, migration is directly or indirectly contributing two-thirds of the increase. Over a longer period, this contribution would rise still further. Conversely, of course, the same point can be made about the role of natural increase in augmenting the growth due to migration alone. And it is important as well to recognize that the natural increase of the rural population is constantly increasing the pool of potential migrants.

To hold anticipated increases in rural populations of Asia down as much as possible, an inexorable increase in levels of urbanization is needed, with Western levels of urbanization, if not the ultimate goal, at least seen as the inevitable concomitant of a successful process of economic development.

But herein lies the dilemma. Western levels of urbanization, if they are to be achieved in Asian populations that will grow by hundreds of millions by the turn of the century and beyond, imply increases in urban populations so massive that they are almost impossible to conceive. Particular concern is expressed about the growth of the largest metropolises, since the region has high levels of urban primacy. Translation of urban growth projections into forecasts of the size of the largest cities 40 years from now, through application of the rank-size rule (modified to fit individual country or city size distributions) to projected urban populations, yields "science fiction" estimates of city populations exceeding 20 million for Bangkok, Manila, Dacca, and Delhi; 35 million for Jakarta; and perhaps 40 million for Calcutta and Bombay. Though such projections of urbanization are based on assumptions of successful industrialization and economic development, which imply an enhanced capacity to sustain massive urban agglomerations, they take us, in planning terms, far beyond anything the world has yet seen and hence into realms of great uncertainty.

A more realistic set of assumptions, implying that countries of the region will still be well behind Western levels of industrialization and urbanization, nevertheless yields the following projected populations for the year 2000 in cities of the countries discussed in this paper: Calcutta, 15.9 million; Bombay, 16.3 million; Madras, 12.3 million; Delhi, 11.2 million; Karachi, 11.4 million; Jakarta, 14.3 million; Manila, 10.5 million; Bangkok, 9.9 million; Seoul, 13.7 million (United Nations, 1982: Table 8). It is not at all clear whether countries at the level of development that India, Pakistan, and Indonesia will have reached by the year 2000 (only 17 years hence) can sustain cities of this size.

There are, of course, other possibilities, for example that the growth of the largest cities will slow because the difficulties of making them desirable places to live, work, and conduct business will divert urban growth elsewhere. Modeling of urban growth to date has failed to integrate adequately the potential feedback of large-city costs (e.g., those resulting from inelastic urban land supplies and overhead investment requirements for housing and social amenities on rural-urban migration decisions [see Kelley and Williamson, 1982:595–99]). This means only that the largest cities may not be as large as projected, but there will be more of them. The trends in Asia are certainly not toward a declining share of large-city population in the total urban population.

Rapid population growth lies at the heart of the urbanization dilemma in the poorer Asian countries. Because of this rapid growth, rapid urbanization is needed to alleviate the problems of the rural areas, while retention of population in rural areas is needed to avoid the problems of massive urban growth. In other words, the stark choice is between overurbanization and overruralization. Reduction of fertility rates is probably the most important element of a responsible policy on human settlement in these countries. Large and sustained fertility reductions are hardly likely without a great deal of structural transformation. Nevertheless, it is essential that complementary policies aimed at fertility reduction be given high priority.

The growth of big city populations in the region, implied by prospective population growth, and desired patterns of economic development place in clear focus the question: "Is there some other way?" Short of breakthroughs in agricultural technology that are as yet only in the realm of fantasy, I argue in this paper that the only "other way" can be through a change in the traditional relationship between urbanization and nonagricultural employment, linked with changes in city-size hierarchies, and that these changes might not be out of the question if suitable policies are adopted.

This paper, then, examines the relationship between urbanization and structural change in production and employment, drawing as far as possible on evidence of historical trends in this relationship, and speculates about future trends. First, a word is needed about data problems.

DATA PROBLEMS

Meaningful comparisons of levels of urbanization in one country over time and between countries at a particular time require that the basis of the estimates be the same, i.e. that the same criteria be employed in determining urban status and that the boundaries of urban localities be demarcated according to their urban characteristics rather than by using political boundaries (see Goldstein and Sly, 1974:12–13). Such uniform criteria are demonstrably not the case in practice. Davis (1969) has shown that levels of urbanization as locally defined tend to be fairly closely correlated, in international comparisons, with levels of urbanization as defined by means of a minimum cut-off point for size of urban places (e.g., a population of 20,000). In particular country comparisons, however, this need not necessarily be the case.

In the present paper I attempt to derive estimates of levels of urbanization that are as comparable as possible. For example, Table 2 presents alternative estimates of urbanization for Thailand that differ rather widely from the estimates normally used, because by comparison with other countries' definitions, the official definitions of urban places used in Thailand appear to understate the level of urbanization.

It is likely that because of the definitions of "urban" used in each country, the level of urbanization in the Philippines is somewhat overstated in this paper relative to that of the other countries, the level in Taiwan overstated (especially for earlier periods) by some of the estimates used later, and the level in Indonesia and the Republic of Korea understated.[2] Moreover, the problem of alternative boundaries of urban places could not be adjusted for. Are the housing estates near Rangsit (north of Bangkok) part of a town, part of the Bangkok metropolitan area, or a rural area? Presumably they are still classified as rural. To the southeast of Bangkok, the city of Cholburi spills well over its official boundaries. Similarly, in Indonesia the areas of mixed agriculture-industry and service activities between Jakarta and Tangerang in the west, Bekasi in the east, and Bogor in the south are considered part of the "Jabotabek" metropolis for planning purposes, but the census continues to classify them as rural. One can assume that the level of urbanization in all the countries under consideration is somewhat understated for similar reasons, but it is unlikely that the degree of understatement is identical in each country.

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[2] For Indonesia, see ESCAP (1981:10–12, Ch. 3). For Korea, the United Nations (1980 and 1982), Kim and Sloboda (1981), and Mills and Song (1979) give almost identical figures for level of urbanization, though the United Nations cites a definition of urban that includes all municipalities with 5,000 or more inhabitants, whereas the other studies cite a definition that includes all municipalities with 50,000 or more inhabitants. It would appear that the United Nations is in error, and that the definition of urban in Korea is more restrictive than that used for the other countries in Tables 1 and 2.

If the urban definitions are a problem, data on employment structure are worse. Elsewhere, I have discussed the Indonesian data problems at length (Jones, 1978, 1981). The problems with the Indonesian data are so great that the use of employment/output coefficients to trace trends in sectoral labor absorption and to project this absorption into the future can be highly misleading. Much of the difficulty in Indonesia, as elsewhere, relates to the classification of those who work in agriculture only seasonally or erratically, particularly those who spend much of their time as homemakers or in handicrafts or trading activities. The percentage of workers in agriculture in Thailand is somewhat exaggerated compared with most other countries because of the more catholic procedures used there to classify females as agricultural workers. In some countries, such as Pakistan and Bangladesh, women's work tends to be understated by male respondents and male interviewers (Nasra Shah and Makhdoom Shah, 1980; Khuda, 1978), but the effect of this on the measured structure of the labor force depends on whether the relative understatement is greater in the agricultural or nonagricultural sector.

In this paper, great care has been taken to establish estimates of urbanization (used in Tables 1 and 2) and of employment structure (used, along with the urbanization data, in Tables 4 and 5) that are as internally consistent and as comparable across countries as possible. Even so, deficiencies clearly remain and some of them may be serious; in particular, the range of possible estimates for Taiwan is too wide to lead to any clear conclusions.[3] Therefore, readers should use the tables presented later in the paper with caution, for broad comparisons, keeping the limitations of the underlying data in mind.

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[3] The Taiwan example illustrates the problems of data inconsistency that must be resolved when data from several sources are used. In 1958–60, according to Simon Kuznets (in Galenson, 1979: Table 1.12), 44 percent of Taiwan's employed population was in agriculture and 20 percent in industry. The World Bank's *World Tables* gave these figures for 1960 as 56 percent and 11 percent, respectively. The Kuznets figure was derived from the regular labor force surveys, whereas the World Bank figure was derived from the annual year-end household registration data. The reason for the discrepancy is not clear. Two sets of data are also available for the level of urbanization. When the two sets of urbanization data are compared with the two sets of labor force data, four widely differing sets of estimates can be derived. They are all shown in Tables 4 and 5.

RECENT TRENDS IN ASIAN URBANIZATION

Asian countries are as variable in urbanization levels and patterns as they are in most other respects. The present paper concentrates on the countries of Southeast Asia and the Indian subcontinent, and also on the Republic of Korea and Taiwan because of the latter two countries' tendency to follow Japan in urbanization and economic structure.

The countries of the Indian subcontinent–India, Pakistan, Bangladesh, and Sri Lanka–have urbanized slowly over this century, though the pace of change has quickened a little over the decade of the 1970s (Table 1). Their slow rates of urbanization have paralleled slow economic development and even slower changes in the proportion of the workforce employed in the agricultural sector. During the 80-year period in which these changes in urbanization have been gradually taking place, the countries' rural populations have increased massively (in India alone from 213 million in 1901 to 522 million in 1981), implying that a given increase in the level of urbanization now will require the shift of much larger numbers of workers than was the case in the past. The patterns provide no reason to doubt that rural populations will continue to grow until at least the end of the century and probably well beyond. This growth could be avoided only by sharper declines in birth rates than appears likely or by a quite dramatic acceleration in economic growth characterized by labor-intensive industrialization, drawing large migration flows from rural to urban areas.

In Southeast Asia the picture is more diverse (Table 2). In Vietnam, there appears to have been a slight decline in the level of urbanization since the Communist takeover in the South. In Indonesia, Thailand, the Philippines, and Malaysia, modest increases in urbanization have taken place in the past quarter of a century. (The picture in Malaysia is complicated by Singapore's earlier role in the Malaysian urban hierarchy and by the forced urbanization during the Emergency period. See Hirschman, 1976.) Of these countries only Malaysia is yet approaching the 50 percent level of urbanization beyond which there is some prospect for cessation of rural population growth.[4]

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[4] This is only a rough rule of thumb, but for countries with rates of population growth exceeding 2 percent per annum and with less than 50 percent of the population in urban areas, sustained increases in the urban population exceeding 4 percent per annum would be required to prevent the rural population

TABLE 1. Levels of urbanization: South Asian countries, 1900–80 (% of total population)

Year	Bangladesh	India	Pakistan	Sri Lanka
1901	2.4	10.8	9.8	11.6
1911	2.5	10.3	8.7	13.2
1921	2.6	11.2	9.8	14.2
1931	3.0	12.0	11.8	13.9
1941	3.7	13.8	14.2	15.4[a] (20.5)[b]
1951	4.3	17.3	17.8	15.3[c] (21.1)[b]
1961	5.2	18.0	22.4	19.1[d] (21.5)[b]
1971	8.8[e]	19.9	25.2	22.4
1981	11.2	23.7	28.3	27.8
1981 urban population (millions)	9.9	156.2	23.7	4.1

NOTE: Definitions of urban:

Bangladesh
Centers with 5,000 or more inhabitants and with such urban characteristics as streets, plazas, sewerage systems, water-supply systems, and electric lights.

India
Towns—that is, places with a municipal corporation, municipal area committee, town committee, notified area committee, or cantonment board; also all places having 5,000 or more inhabitants, a density of not less than 1,000 persons per sq mi or 390 per sq km, pronounced urban characteristics, and at least three-fourths of the adult male population employed in pursuits other than agriculture.

Pakistan
Municipalities, civil lines, cantonments not included within municipal limits, any other continuous collection of houses inhabited by not fewer than 5,000 persons and having urban characteristics, and also a few areas having urban characteristics but fewer than 5,000 inhabitants.

Sri Lanka
Municipalities, urban councils, and towns.

a. 1946.

b. Figures in parentheses are data adjusted by Gunatilleke for the probable earlier populations of towns newly awarded urban status in the intercensal period.

c. 1953.

d. 1963.

e. 1974.

SOURCES: Bose (1975: Table 1), Chaudhury (1980: Table 2), ESCAP (1980b: Table 19), 1980 Censuses of India and Pakistan, Gunatilleke (1973); Karim and Shah (1982: Table 1).

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from increasing. The required rate of increase rises with higher rates of population growth and with lower initial proportions of urban population.

Of all the countries included in Tables 1 and 2, only one experienced sharp increases in the level of urbanization in the 1960s, and that was the Republic of Korea, where rapid urbanization continued until 1980. Korea's rapid urbanization appears to have been due to its spectacular industrialization and economic development during the period. But similar rates of economic development in Taiwan during the 1960s (Little, 1979: Fig. 7.1) do not appear to have led to a comparable pace of urbanization. Perhaps the difference is related to Taiwan's higher level (and more even spread) of urbanization to begin with, combined with heavier investment in the agricultural sector in the 1960s and financially stronger local governments (Renaud, 1981: 47). It may also be due in part to Taiwan's more decentralized pattern of industrialization, with small- to medium-scale and more labor-intensive manufacturing enterprises widely distributed through the rural areas (Ho, 1979).

Malaysia's urbanization was quite rapid during the 1970s, although dampened by heavy government investment in land settlement schemes and rural development projects. In India and Sri Lanka the pace of urbanization appeared to pick up slightly in the 1970s. This also appeared to be the case in Indonesia, but the urban populations enumerated in the 1971 and 1980 censuses cannot be directly compared because of a change in the criteria used to categorize small towns as urban or rural. That the 50 *kotamadya* (municipalities) increased their share of the total population only from 12.4 percent in 1971 to 14.2 percent in 1980, despite a number of boundary extensions in the interim, suggests a slow increase in urbanization. The available evidence for other countries does not suggest a rapid pace of urbanization during the 1970s.

URBANIZATION AND THE MOVEMENT OUT OF AGRICULTURE

Discussion of urbanization in Asia in the 1950s and 1960s was dominated by the overurbanization thesis. Simply stated, the thesis holds that urbanization is outpacing industrialization in developing countries in the sense that urban fractions of the population are larger in relation to industry's share of the workforce than they were at earlier times in currently developed countries (Hoselitz, 1953, 1957; see also Hauser, 1957).

The United Nations (1980) has examined this relationship in the

TABLE 2. Levels of urbanization: Southeast and East Asian countries, 1920–80
(% of total population)

Year	Thailand[a]	Philippines	Indonesia	Malaysia[b]	Vietnam	Republic of Korea[c]	Taiwan[d]
1920	u	—[e]	5.8	14.6[f] (14.0)	u	3.3	u
1930	u	u	6.7	16.9[g] (15.0)	u	4.5 (6.9)	u
1940	u	21.6[h]	u	u	u	11.6 (16.0)	u
1945	(9.9)[i]	u	u	21.3[i] (19.0)	u	14.5	u
1950	(10.5)	27.1	12.4	u	u	18.4	u
1955	(11.5)	28.7	13.5	32.0[j] (26.5)	u	24.5	56.7 (32.2)
1960	16.2 (12.5)	30.3	14.8[k]	u	u	28.0	58.4 (34.7)
1965	18.3	31.6	15.8	u	u	33.9	59.7 (36.8)
1970	20.8 (14.7)	32.9	17.2[l]	34.1 (28.7)	u	41.1	62.4 (40.5)
1975	22.5[m]	34.3	18.4[n]	u	20.6[n]	48.4	64.9 (44.2)
1980	24.5[p] (17.3)	36.2	22.4	41.0 (37.4)	19.1[q]	54.8	66.8 (47.2)
1980 urban population (millions)	11.4	17.8	32.8	4.5	10.1	21.0	11.9

NOTE: Definitions of urban:

Thailand

Municipal areas, plus sanitary districts with populations exceeding 5,000 and population density of at least 1,000 per sq km.

Philippines

Baguio, Cebu, and Quezon City; all cities and municipalities with a density of at least 1,000 persons per sq km; administrative centers, *barrios* (villages) of at least 1,000 inhabitants that are contiguous to the administrative center, in all cities and municipalities with densities of at least 500 persons per sq km; administrative centers and *barrios* of at least 2,500 inhabitants that are contiguous to the administrative center, in all cities and municipalities with at least 20,000 inhabitants; all other administrative centers with at least 2,500 inhabitants. For further details on urban definitions in the Philippines, see World Bank (1976:61–7).

Indonesia
Municipalities, regency capitals and other places with urban characteristics. A new procedure for defining places with urban characteristics was used in 1980.

Malaysia
Gazetted areas with populations exceeding 5,000.

Vietnam
Not available.

Republic of Korea
Seoul City and administrative *shi* (cities) of 50,000 or more inhabitants.

Taiwan
Population not living in rural townships.

u–data unavailable.

a. Figures in parentheses are for municipal areas.
b. Peninsular Malaysia. Figures in parentheses are for populations living in gazetted areas of over 10,000 inhabitants.
c. Figures in parentheses are for populations living in administrative areas with 20,000 or more inhabitants.
d. Figures in parentheses are for populations not living in rural or urban townships.
e. Percentage was 13.1 in 1903.
f. 1921.
g. 1931.
h. 1939.
i. 1947.
j. 1957.
k. 1961.
l. 1971.
m. 1974.
n. 1976.
p. 1978.
q. 1979.

SOURCES: Robinson and Wongbuddha, 1980:40, Table 1; Herrin, 1981; Hugo, 1978: Table 111.1; Hirschman, 1976:447; Jones, 1982:794; United Nations, 1980: Table 50; United Nations, 1982: Table 1; Liu, 1982; Kim and Sloboda, 1981: Table 19; Mills and Song, 1979: Table 2.1.

TABLE 3. Regional relationships between urbanization of population and industrialization of the labor force: 1950 and 1970

Major area and region	1950			1970			
	% of labor force in industry^b (1)	% of population living in urban areas (2)	Ratio, (1)/(2) X 100 (3)	% of labor force in industry^b (4)	% of population living in urban areas (5)	Ratio, (4)/(5) X 100 (6)	Change, 1950–70 (ratio, (6)/(3)) (7)
World^a	18.8	34.0	55.2	24.2	41.8	57.8	1.045
Africa							
Eastern Africa	3.7	5.5	66.5	6.3	10.7	59.1	0.888
Middle Africa	6.0	14.6	40.3	9.5	25.2	37.9	0.941
Northern Africa	10.4	24.5	42.6	15.7	36.6	43.0	1.010
Southern Africa	24.6	37.3	65.9	26.3	43.8	60.2	0.914
Western Africa	6.1	10.1	60.1	11.3	17.3	65.4	1.089
Latin America							
Caribbean	16.7	33.1	49.7	21.1	45.1	46.8	0.941
Middle America	16.0	39.7	40.3	21.4	53.9	39.6	0.982
Temperate South America	31.1	64.8	47.9	31.1	77.9	40.0	0.833
Tropical South America	16.2	36.3	44.7	19.6	56.0	34.9	0.782
Northern America	36.5	63.8	57.2	34.2	70.4	48.5	0.848
East Asia^a							
Japan	23.6	50.2	47.0	34.5	71.3	48.4	1.028
Other East Asia	13.3	28.6	46.5	25.4	47.5	53.5	1.150

South Asia							
Eastern South Asia	7.1	14.8	48.2	10.1	20.0	50.2	1.042
Middle South Asia	8.1	15.6	52.3	13.0	19.4	67.2	1.286
Western South Asia	13.4	23.4	57.3	18.4	44.5	41.4	0.722
Europe							
Eastern Europe	26.7	41.5	64.4	37.6	53.3	70.6	1.095
Northern Europe	44.8	74.3	60.2	42.6	81.3	52.5	0.871
Southern Europe	21.5	41.0	52.4	31.0	52.9	58.6	1.118
Western Europe	39.7	63.9	62.2	44.5	74.4	59.8	0.962
Oceania	31.2	61.2	50.9	30.4	70.8	42.9	0.843
USSR	21.6	39.3	55.0	37.6	56.7	66.4	1.207

NOTE: Percentages presented in the United Nations (1980) source as correct to two decimal places have been rounded to one decimal place to avoid a spurious impression of accuracy.

a. Excluding China.

b. Industry includes transport.

SOURCE: United Nations (1980: Table 9).

light of more recent evidence. Although, as argued below, industry/urban ratios are not theoretically very meaningful, they are discussed here briefly because of the attention they have received in the overurbanization debate. The United Nations' table presenting comparisons between 1950 and 1970 for all the world's regions (United Nations, 1980: Table 9) is therefore reproduced as Table 3.

One is struck by several aspects of this table. The first is the rather large differences in industry/urban ratios between developing regions, ranging in 1970 from .35 in tropical South America to .50 in Southeast Asia and .67 in Middle South Asia. In Latin America, changes in the ratio between 1950 and 1970 indicate that urbanization has been outpacing industrialization. (See also Jansen and Paelinck, 1981.) The main factor is a deficiency of nonagricultural occupations in rural areas of Latin America. In Middle South Asia, by contrast (and paradoxically, this is the region to which the original overurbanization thesis was applied), urbanization has not kept pace with industrialization. By 1970, Middle South Asia was more industrialized but slightly less urbanized than Southeast Asia.

The regional differences shown in Table 3 no doubt mask even wider differences between individual countries. Table 4 presents the same ratios as in columns (3) and (6) of Table 3 for ten Asian countries, based on my efforts to derive consistent data sets. The differences between them are wide and the trends over time are variable. Table 4 indicates that in 1960, the three countries of the Indian subcontinent for which data are available had higher ratios than the other countries, thus supporting the data in Table 3 that show them to be relatively underurbanized. Regarding the trend before 1970, however, the two sources diverge. Table 4 shows that ratios in all four countries declined during the 1960s, the reverse of the trend shown for Middle South Asian countries as a whole in Table 3. The figures in Table 3 refer to the longer period of 1950–70, and to a larger group of countries than the four included in Table 4. Even so, there does appear to be an inconsistency between the trends, which suggests possible discrepancies in the data used by the two sources.

Whereas the ratios for all South Asian countries in Table 4 declined, the trends in East and Southeast Asian countries were mixed, though more ratios rose than fell. Thus there was a degree of convergence in the ratios.

Although national idiosyncracies in definitions of the urban popula-

TABLE 4. Relationship between urbanization of population and industrialization of the labor force: selected Asian countries, various years

Country	% of labor force in industry ÷ % of population urban X 100							Direction of change between earliest and latest year
	1946	1955	1960	1965	1970	1975	1980	
Philippines	u	58.5[a]	51.7	u	47.7	44.0	47.2	↓
Indonesia	u	u	54.1[b]	u	41.9[c]	u	56.2	↑
Malaysia (1)	63.8[d]	51.9[e]	u	u	55.1	u	62.0	↓
Malaysia (2)	71.6	62.6[e]	u	u	65.5	u	69.9	↓
Rep. of Korea	u	u	33.2	46.3[f]	51.3	u	52.7	↑
Taiwan (1)	u	30.0	34.1	39.2	45.4	54.7	62.6	↑
Taiwan (2)	u	17.6	19.5	20.3	25.5	36.4	47.0	↑
Taiwan (3)	u	52.8	57.3	63.6	69.9	80.3	88.6	↑
Taiwan (4)	u	31.1	32.9	32.9	39.3	53.4	66.5	↑
Thailand	24.2[d]	u	35.8	u	35.1[g]	u	36.0	↑
India	70.5[h]	u	61.1	u	55.3	u	54.9	↓
Pakistan	u	u	79.9	u	74.2	u	70.7	↓
Bangladesh	u	u	63.5	u	39.8	u	u	↓
Sri Lanka	76.0	86.9[i]	u	69.6[j]	67.9[c]	u	51.9	↓

NOTES:

Malaysia (1) figures are based on the main estimate of urbanization given in Table 2.

Malaysia (2) figures are based on the alternative estimate of urbanization given in parentheses in Table 2. All Malaysian figures refer to Peninsular Malaysia.

Taiwan (1) figures represent high estimate of urbanization and high estimate of employment in industry (labor force survey data).

Taiwan (2) figures represent high estimate of urbanization and low estimate of employment in industry (end-of-year household registration data).

Taiwan (3) figures represent low estimate of urbanization and high estimate of employment in industry (labor force survey data).

Taiwan (4) figures represent low estimate of urbanization and low estimate of employment in industry (end-of-year household registration data).

u—data unavailable.

a. 1956.
b. 1961.
c. 1971.
d. 1947.
e. 1957.
f. 1966.
g. 1969.
h. 1950.
i. 1953.
j. 1963.

SOURCE: Individual country tables available from author.

tion no doubt serve to widen the differences among countries (and, to a lesser extent, regional differences) shown in Tables 3 and 4, the relationship between industrial employment and urban residence is not so clearcut in interregional and temporal comparisons as to be reliable in predicting future trends in any country or region. This point is reinforced if one compares present-day developing countries with developed countries at a similar stage in their urbanization process. It is estimated that 21.6 percent of the labor force of the currently developed countries was engaged in industry in 1900, at a time when the urban percentage in those countries was 27.3 (United Nations, 1980:19). Clearly, the "typical" 1:2 ratio between industry's share of the labor force and urban areas' share of total population did not prevail at that time. Nor, in fact, does it prevail today in the developed countries.

Although the United Nations study stresses the comparison between urbanization and employment in industry, theoretically a more meaningful comparison is between urbanization and nonagricultural employment. It is only agricultural occupations that are, by virtue of their extensive land requirements, confined almost exclusively to rural areas. Both secondary and tertiary activities are much more flexible in their choice of location. Moreover, technological developments in the twentieth century appear to have placed a ceiling on the share of the labor force likely to be reached by the secondary sector. Developing countries are therefore tending to skip Colin Clark's (1957) intermediate stage, where the share of employment in industry increases sharply, and urbanization levels may therefore become more closely associated with the tertiary than with the secondary share of the labor force (Jakobson and Prakash, 1971; Moir, 1976).

Table 5 presents, for the same countries as in Table 4, data on the relationship between urbanization and the total nonagricultural share of the workforce. As with the previous measure, there is a rather wide range in the nonagriculture/urban index. Compared with the mean, Thailand, the Republic of Korea, and, according to measures (1) and (2), Taiwan, appear "overurbanized," whereas Sri Lanka and Indonesia are relatively "underurbanized," though these differences should not be taken to imply that the mean necessarily represents a norm or optimum state of affairs. (The low figure for Thailand is undoubtedly inflated by the understatement of the share of employment in nonagricultural industries noted earlier, though this would be offset to

TABLE 5. Relationship between urbanization of population and decline in agricultural share of labor force: selected Asian countries, various years

Country	% of labor force in agriculture ÷ % of population urban X 100								Direction change between earliest and latest year
	1946	1950	1955	1960	1965	1970	1975	1980	
Philippines	u	u	152[a]	130	u	151	142	149	u
Indonesia	u	u	u	180[b]	u	181[c]	u	199	↑
Malaysia (1)	162[d]	u	126[e]	u	u	145	u	154	↓
Malaysia (2)	182[d]	u	152[e]	u	u	172	u	169	↓
Republic of Korea	u	u	u	118	124[f]	121	u	120	u
Taiwan (1)	u	u	105	96	95	101	108	118	↑
Taiwan (2)	u	u	69	74	76	89	98	107	↑
Taiwan (3)	u	u	168	161	154	156	159	166	u
Taiwan (4)	u	u	122	124	124	137	143	152	↑
Thailand	109[d]	u	u	103	u	105[g]	u	98	↓
India	u	173	u	150	u	136	u	131	↓
Pakistan	u	u	u	175	u	163	u	152	↓
Bangladesh	u	u	u	254	u	160	u	u	↓
Sri Lanka	257	u	283[h]	u	231[i]	209[c]	u	165	↓

NOTES: Same as in Table 4, except that nonagricultural employment should be substituted for industry in the Taiwan notes.

u–data unavailable.

a. 1956.
b. 1961.
c. 1971.
d. 1947.
e. 1957.
f. 1966.
g. 1969.
h. 1953.
i. 1963.

SOURCE: Individual country tables available from author.

some extent by the tendency for the level of urbanization in Thailand to be understated as well.) As a broad generalization, the poorer, more agricultural countries (Indonesia, Sri Lanka, Pakistan, and Bangladesh) appear underurbanized by comparison with the wealthier countries, though India is an exception. The tendency in most of the countries is for the index to fall over time (i.e., for urbanization to grow faster than the shift out of agriculture); but in about half of the countries the trend is too slight to indicate any significant change, in view of the unreliability of the underlying data.

Few clearcut conclusions emerge from Table 5 therefore, but the important point to note is the wide range in the ratios, indicative of a wide range in the relationship between urbanization and the shift out of agriculture and suggestive of some flexibility in the way this relationship might work out over time in any particular country.

Analytically, how should one view the relationship between changing employment structure and urbanization? Although the United Nations study, as noted earlier, does not directly analyze the relationship between urbanization and nonagricultural employment as a whole, it does throw light on this question in a chapter that examines the employment structure of urban and rural areas in different parts of the world. In countries still largely agricultural (more than 50 percent of the total labor force in agriculture), a substantial part of total nonagricultural employment is in rural areas: around half of all employment in industry and almost half of all employment in sales and services (United Nations, 1980: Table 25; see also Anderson and Leiserson, 1980). In Sri Lanka three quarters of manufacturing employment in 1971 was in rural areas (ESCAP, 1980b:8). Agriculture, of course, provides most rural employment in these countries, but even in countries with as much as one-half to two-thirds of their labor force in agriculture, one-quarter of rural employment is in nonagricultural occupations. The situation in South and East Asian developing countries for which data are available is shown in Table 6.

In developed countries, where agriculture provides only a small proportion of total employment, more than half of all employment in rural areas is in nonagricultural activities, and in some of them this fraction reaches three-quarters. These cross-sectional data suggest that there is an occupational transition in rural areas as development proceeds, with the rural employment structure displaying a steadily increasing proportion of nonagricultural employment. Decomposing the

TABLE 6. Occupational composition of urban and rural labor force: selected Asian countries

Country, year, and urban/rural	Agriculture	Manufacturing & transport	Professions & administration	Clerical & sales	Traditional services	Unknown
India, 1961						
Total	72.9	15.9	2.7	5.3	3.0	0.2
Urban	12.3	43.9	9.8	23.0	10.5	0.5
Rural	82.8	11.3	1.5	2.5	1.7	0.2
Indonesia, 1971						
Total	59.6	11.8	5.6	13.3	3.8	6.0
Urban	9.5	25.4	8.2	34.7	11.7	10.6
Rural	68.5	9.4	5.2	9.4	2.4	5.1
Indonesia, 1980						
Total	54.7	18.8	3.2	16.6	4.6	2.1
Urban	9.8	33.6	6.6	34.9	11.1	4.0
Rural	65.2	15.3	2.3	12.3	3.1	1.8
Peninsular Malaysia, 1970						
Total	46.1	18.9	5.2	12.9	7.9	9.1
Urban	6.7	31.2	10.2	26.6	15.3	10.0
Rural	61.3	14.1	3.3	7.6	5.0	8.7
Sri Lanka, 1953						
Total	51.3	16.3	4.8	10.8	14.7	2.1
Urban	5.9	24.1	9.7	26.1	30.5	3.7
Rural	59.6	14.9	3.9	8.1	11.8	1.8

TABLE 6. *(continued)*

Country, year, and urban/rural	Agriculture	Manufacturing & transport	Professions & administration	Clerical & sales	Traditional services	Unknown
Sri Lanka, 1970						
Total	50.8	24.5	6.0	11.2	7.4	0.2
Urban	8.8	38.2	12.2	26.5	14.1	0.2
Rural	58.7	21.9	4.8	8.3	6.1	0.2
Thailand, 1954						
Total	88.0	4.2	1.5	4.4	1.1	0.8
Urban	12.2	31.3	9.1	30.5	10.2	6.7
Rural	92.6	2.6	1.1	2.8	0.6	0.4
Thailand, 1970						
Total	81.3	7.6	2.5	5.9	2.5	0.1
Urban	7.9	31.0	14.9	30.8	14.9	0.5
Rural	89.4	5.1	1.2	3.1	1.2	0.1

SOURCES: United Nations (1980: Table 51); Biro Pusat Statistik (1982: Table 48).

changes in the occupational structure of the total labor force into three components:

(a) the amount due to changes in the occupational structure of the rural labor force,
(b) the amount due to changes in the occupational structure of the urban labor force, and
(c) the amount due to shifts in the rural/urban residential composition of the labor force,

one finds that changes in urban labor force structure contribute a relatively minor share of the overall changes in occupational structure, whereas the remaining two components contribute roughly equal amounts for all occupations except manufacturing, where two-thirds of the growth is attributable to increased manufacturing employment in the rural labor force (United Nations, 1980:70).

Time-series data support the occurrence of a rural occupational transition (United Nations, 1980: Table 29) in both developed and developing countries. In Japan, the proportion of the rural labor force in agriculture fell from 54 percent to 38 percent in just ten years (1960–70). In the United States, a net exporter of food, by 1970 only 11 percent of the rural labor force worked in agriculture.

The rural labor force, then, does not simply passively release agricultural workers for nonagricultural employment in the towns. Rather, it undergoes major modifications in occupational structure during the course of economic development. For the purpose of this paper, a key question is whether, in the large, poor countries that are still predominantly agricultural and rural–India, Bangladesh, and Indonesia, for example–elements of this "occupational transition" of rural areas can be captured despite the prospects of only a slow shift in their overall employment structure away from heavy dependence on agriculture; in other words, whether the nexus between urbanization and the shift in the overall employment structure away from agriculture can be broken to some extent. The evidence presented earlier about the wide range in both industry/urban ratios and nonagricultural employment/urban ratios suggests that theoretically it should be possible.

HOW INEXORABLE IS THE SHIFT OUT OF AGRICULTURE?

So far I have discussed the relationship between urbanization and the decline in agriculture's share of employment. But how inexorable, in fact, is the shift out of agriculture? The Clark-Fisher hypothesis, documented as well by Kuznets (1966), is that

> as time goes on and countries become more economically advanced, the numbers engaged in agriculture tend to decline relative to the numbers in manufactures, which in turn decline relative to the numbers in services (Clark, 1957:492).

Most explanations of this hypothesis distinguish between a demand explanation and a supply explanation. On the demand side, the income elasticity of demand for food and agricultural products is lower than it is for products of the nonagricultural sectors; and if there is no change in the relative labor productivities, the agricultural sector will employ a declining proportion of the labor force. On the supply side, labor-saving technological developments, it is argued, have tended to occur first in agriculture. Later, industrial technology has been increasingly automated so that labor is again released to the services sector. It can be shown that in a closed economy with full employment

> there is a simple relationship, namely that the variation in the agricultural share of the labour force depends on whether the ratio of the rates of growth of productivity in the [agricultural and nonagricultural] sectors is greater or less than the ratio of the respective income-elasticities of demand (Booth and Sundrum, 1980:3).

Or, in algebraic form,

$$\lambda_a' - \lambda_a = \frac{\lambda_a \lambda_b \,(R_b \epsilon_a - R_a \epsilon_b)}{\lambda_a \epsilon_a\,(1 + R_b) + \lambda_b \epsilon_b\,(1 + R_a)}$$

$$\lambda_a' \lesseqgtr \lambda_a \text{ according as } \frac{R_a}{R_b} \gtrless \frac{\epsilon_a}{\epsilon_b}$$

where λ_i is the share of the labor force, ϵ_i the elasticity of demand, and R_i the rate of growth of productivity, in the i-th sector ($i = a$ for agriculture, $= b$ for industry).

Since the income elasticity of demand for agricultural goods is normally less than unity and the income elasticity of demand for nonagricultural goods greater than unity, in order that the share of the labor force in agriculture decrease over time, it is not necessary that R_a be equal to or greater than R_b but only that the ratio R_a/R_b be greater than ϵ_a/ϵ_b, which is less than unity. This condition does require some minimum rate of growth of labor productivity in agriculture, a minimum that has been exceeded in the historical experience of the developed countries. Booth and Sundrum argue, however, that "it cannot lightly be assumed that the rate of growth of labour productivity in agriculture in these LDC's [less developed countries] will exceed this critical minimum rate in the near future, or even that this is desirable as a medium-term policy goal" (p. 5).

From an analysis of trends in employment structure in developed countries, Booth and Sundrum conclude that the rapid fall in the agricultural share of employment was due partly to the factors highlighted in their model (low income elasticities of demand for agricultural goods, which caused R_a/R_b to exceed ϵ_a/ϵ_b even though rates of growth of productivity in agriculture were generally lower than those in the nonagricultural sector), partly to the reduction of underemployment or surplus labor that was included in the statistics of agricultural employment, and partly to the increasing reliance on imports of agricultural goods.

As for the developing countries, time-series data for India and the Republic of Korea show little change over long periods before World War II. More recent data (1960–77) for a larger number of developing countries show that in low-income countries the high agricultural share of employment remained relatively stable until 1977, but in middle-income countries the share declined quite rapidly. In the low-income countries, agricultural productivity has risen very slowly; surplus labor in rural areas also inflates the figures for the agricultural share of the labor force. In the middle-income countries, the growth of agricultural productivity has been more rapid; but the decline in the proportion of workforce in agriculture was almost entirely due to demand factors, except in those countries where the share of agriculture in employment was already less than half in 1960. In these middle-income countries, labor shed by the agriculture sector went primarily into the services sector.

Booth and Sundrum recognize that the percentage of the labor force in agriculture will inevitably decline over long periods, because

> the income elasticity of demand for food will reach near zero values with growth of income and because for most regions the technology is available by which the demand for foodstuffs and the other principal products of the agricultural sector can be met by a much smaller fraction of the labour force than is at present engaged in agriculture in most LDC's (p. 20).

But they argue that until the end of this century, "we cannot assume either that ϵ_a values in LDC's will decline rapidly relative to ϵ_b values or that R_a will even be positive, let alone quite high relative to R_b" (p. 20). Policies of income transfers to increase the purchasing power of the poor could prevent ϵ_a from declining, and adoption only of the more labor-using technological developments in agriculture could hold down R_a relative to R_b. Thus at least in the more densely populated parts of the developing world the proportion of the labor force in agriculture could conceivably even increase in the next two decades.

DISASSOCIATING URBANIZATION FROM THE SHIFT OUT OF AGRICULTURE

What is the import of this rather provocative conclusion for the urbanization prospects of the countries of South and Southeast Asia? Most importantly, it suggests that in the South Asian countries and Indonesia, where proportions urban are low and the proportions of the workforce in agriculture high, the shift of the employment structure away from agriculture may continue to be slow, because productivity will continue to rise more rapidly in the nonagricultural sector than in agriculture. (In Indonesia, however, it may be necessary to draw a distinction between densely settled islands of Java, Bali, and Lombok and the outer islands in this respect. Productivity growth in agriculture could be much higher in the latter.) A quite different pattern is already being observed in the Republic of Korea and Malaysia, where burgeoning industrialization and service-sector employment are drawing workers out of agriculture and creating an incipient agricultural labor shortage, with consequent labor-saving technological changes in agriculture.[5] Here the trend toward a Western employment structure appears to be inexorable. Countries such as Thailand and the Philippines are likely to occupy an intermediate position.

Do the expected shifts in employment structure necessarily imply an inexorable shift to Western levels of urbanization—a rapid shift in the Republic of Korea and Malaysia, a gradual shift in the Philippines and Thailand, and a slow shift in South Asia, where the shedding of labor by the agriculture sector will be modest (modest, that is, in proportionate terms but large in absolute terms because of the large populations involved)? The question is important, especially for the South Asian countries, because with growth rates of population and labor force exceeding 2 percent per annum, even a modest shedding of labor by the agricultural sector, if it must be accommodated in urban areas, implies a growth rate of urban populations of 3 percent per annum or more, enough to double their size in 23 years or less. Moreover, as noted earlier, Western levels of urbanization in the larger countries imply metropolises of truly vast size.

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[5] Malaysia's Fourth Five-Year Plan estimates that agriculture's share of employment fell from 50.5 percent in 1970 to 40.6 percent in 1980. (Government of Malaysia, 1981: Table 4-6). For evaluation of the rural labor shortage in Malaysia, see Lim (1981) and Jones and Ward (1981).

The earlier analysis of the relationship between urbanization and changing employment structure suggests that the decline in agriculture's share of the labor force does not have to be followed by an equivalent increase in urbanization. The three-way decomposition of the change in occupational structure of the labor force noted earlier implies that the shift out of agriculture does not have to be accommodated by shifts in the rural–urban residential composition of the labor force; alternatively it can be accommodated by changes in the occupational structure of the rural labor force.

How might such changes be brought about? Basically, just as developing countries have sidestepped the stage in the Clark-Fisher model where employment in industry increases at the expense of agriculture and moved straight to the stage at which labor shed by agriculture shifts directly into services, so too can they modify the traditional urbanization–occupation nexus during the structural transformation of their economies. The latecomers in the development process can take advantage of the most up-to-date technologies. Developments in transport mean that many people even in poor countries can commute up to 50 miles to work, an option not available in industrializing nineteenth-century Europe. Besides enabling the bedrooms of the urban workers to be located further from the heart of the city, transport developments facilitate patterns of circular mobility that do not require continuous residence in the city (Hugo, 1981, 1982; Stretton, 1981; Singhanetra-Renard, 1981). They also facilitate the siting of factories and other nonagricultural activities in the rural areas, where they can take advantage of the large, and increasingly educated, workforce.

Thus the rural–urban dichotomy, so clearcut in the medieval fortress towns of Europe, begins to lose its meaning. Developing Asian countries are already copying the Japanese pattern whereby much of the rural workforce is engaged in both agricultural and nonagricultural activities. In Japan, Taiwan, and the Republic of Korea, off-farm incomes are about 60 percent, 50 percent, and 40 percent, respectively, of total farm-family incomes (Oshima, 1976).[6] Taiwan has been remarkably successful in diversifying the income sources of farm households, through both an increase in commuting and a broadening of employment opportunities in the rural areas themselves (Ho, 1979; Chinn, 1979). More recently, Korea's industrial location policy, fostering decentralization of industry, and the "Samaul Undong" (New Community Movement) appear to have been successfully enlarging off-farm employment opportunities (Nam and Ro, 1981: 654–56).

Even in the poorer parts of rural Asia, such patterns are of considerable importance. A recent study in Kelantan, the poorest state of Malaysia, showed that 50 percent of the income of the paddy farming families surveyed was derived from off-farm activities (Shand and Hussein, forthcoming). In the Philippines, 28 percent of the rural labor force was classified in nonagricultural activities in 1972 and "perhaps 15 per cent of rural families whose main source of income is in primary activities have additional income from secondary or tertiary activities" (ILO, 1974:508). In the state of Karnataka in India, off-farm employment is becoming increasingly important in larger villages on main roads (Caldwell et al., 1982:691). In Bali, an extraordinary range of "microeconomic niches" is used to supplement the meager income from tiny farms (Poffenberger and Zurbuchen, 1980: 107–20). In Java, 28 percent of the rural labor force was classified in nonagricultural activities in 1971. Some of the manufacturing employment undoubtedly resulted from factory overspill into areas classified as rural (for example, along the Jakarta-Bogor and Surabaya-Sidoardjo roads). However, this was probably a fairly small component.

> Rural manufacturing is highly diversified, running the gamut from small textile and cigarette factories to batik-making and brickmaking, repair of bicycles and agricultural implements, production of coconut oil or *tempe* (fermented soya bean cakes) to weaving of mats and hats. Trading is an activity which provides supplementary income for large numbers of rural families and the main source of income for many others. Carpenters and builders are active throughout the rural areas, as are barbers, dukuns,

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[6] Somewhat lower figures are mentioned for 1975 in Ho (1979:77) and Chinn (1979:299): 52 percent for Japan, 4[illegible] percent for Taiwan, and only about 23 percent for Korea.

> midwives, and others in service activities of various kinds. Household service opportunities are available in the wealthier rural households or in neighbouring towns or cities. The rural-based transport network is very labour-intensive, with *becaks, dokars,* even in West Java the *ojeg* transport system (use of bicycles to transport up to 200 kg. loads (Jones, 1980:529).

In the Yogyakarta region, the growth of small, labor-intensive manufacturing industries along the main roads has been noted (McDonald and Sontosudarmo, 1976:84), although it is not clear whether some of this development has been at the expense of similar activities or traditional handicrafts in more isolated areas. At least it seems clear that where transport systems are adequate, there is great potential for this sort of development in Java, as well as for the siting of large factories in rural areas. Rural population densities in Java exceed those found in urban areas in many countries, thus providing a concentrated workforce whose average educational level is being gradually raised. Land costs are lower than in the cities, and rural wage levels are low. In other words, the potential is there for the growth of nonagricultural employment to outstrip the growth of urbanization. Sumitro (1977) has raised the specter of Java as an "island city" by the year 2000, but he was basing this scenario mainly on the high population densities that will be reached by then (over 1,000 persons per sq km). The important point for planning is that the quasi-urban population densities and employment structure could be attained without the need for the same vast and complex infrastructural investments that would be required if this growth were to take place in the metropolises such as Jakarta, Surabaya, and Semarang. Unfortunately, it may also be the case that the investments needed if the growth takes place in dispersed rural areas, besides being less complex, can more conveniently be overlooked.

I would argue that the kinds of accommodations being made in Indonesia, and probably also in the crowded countries of South Asia, are inevitable escape valves for an otherwise intolerable growth of urbanization (intolerable, that is, from the point of view of both those entrusted with the provision of city services and those who must try to live there on very low incomes).

Many counterforces are at work, of course. Larger-scale industrial plants and service-sector enterprises may be attracted to rural areas only if transportation and communication networks are improved and if the rural labor force is well enough educated and trained to meet their needs. But development of transportation also facilitates movement away from the rural areas, and educated young people seem to have stronger motives to move to the towns than the uneducated (Connell et al., 1976: ch. 3). Some deliberate policy measures will be needed to reinforce the tendency for increased diversification of the rural employment structure. Just what these measures should be is not easy to determine and will vary by country, but a central need is to raise rural purchasing power, so that a local market will develop for various kinds of goods and services. People without bicycles have no need for bicycle repair shops, nor are the impoverished likely to use the services of a village barber. Thus raising productivity in agriculture must be a key component of any strategy to diversify avenues of employment in rural areas.

FOSTERING BALANCED PATTERNS OF URBAN GROWTH

A key question that has not yet been addressed in this paper concerns the linkages between policies to foster a lower rate of urban growth with any given change in economic structure and policies to encourage a more balanced pattern of urban growth. To anticipate the argument to follow, it appears logical to view these not as alternative, but instead as complementary, policies.

On the whole, urban systems in Asian countries are highly polarized. This polarization did not emerge spontaneously.

> In most cases the evolution of the spatial development patterns in Asia was the result of deliberate location decisions and consistent investment policies that resulted in a heavy concentration of national resources for production, physical infrastructure, social services and public facilities in a single city or a few large metropolitan centers. These centers now have concentrations of productive and social overhead assets vastly greater than their share of national population. . . . Once polarization occurred, the effects reinforced each other to keep the primate city dominant and to make development of other cities and regions more difficult (Rondinelli, 1980: 333, 335).

Forces were set in motion that were later difficult to reverse or mitigate.

It is not necessary here to belabor the evidence for urban bias in development strategies and investments, provision of social services, and wage and price rewards (see Lipton, 1977: ch. 13; Renaud, 1981: 101–8; Rondinelli, 1980; Keyfitz, 1982:661–8; Todaro with Stilkind, 1981). What should be emphasized is that among national planners the urban (or metropolitan) bias of policies adopted in good faith to assist certain groups is not always fully recognized. Three examples might be cited from Thailand, not because it is more prone to such situations than other Asian countries but because I know it better than most of the others. First, Thailand's well-known rice subsidy holds down the price of this basic staple to urban consumers but also holds down the prices paid to the farmers who produce it. Second, minimum wages in Thailand used to be set higher in Bangkok than in the provincial towns in recognition of Bangkok's higher cost of living. But because of pressure from the provinces to remove discrimination in wage policy, in 1982 the minimum wage was set at 61 *baht* (equivalent to US $2.77) in all cities. The new policy may result in the closure of some factories in provincial cities, which relied on the lower minimum wages to offset the many disadvantages of locating away from Bangkok. Third, the Bangkok mass transit authority, which runs Bangkok bus services, has [illegible] losses of 3.5 billion *baht* in seven years of operation. Only recently have fares been raised from their previously low levels, in response to pressure from the Ministry of Finance (*Far Eastern Economic Review*, March 1983).

To redress the first two policies would be to improve rural farm incomes relative to urban incomes, in the first case, and to make smaller cities a better investment magnet, in the second case. The recent fare rise for public transportation should free tax revenues, largely derived from the rural sector, for investment in rural or smaller-city development rather than for subsidization of metropolitan workers. These examples, which could be multiplied manyfold, hint at the logical relationship between strategies that will lower the pace of urbanization and those that will affect the structure of urbanization, favoring smaller-city rather than primate-city growth.

I do not intend to develop in any detail here the relationship between a strategy of retaining population in rural areas and the kind of strategy that might be adopted to affect the spatial distribution and growth of cities. The relative merits of growth-pole strategies; more general promotion of secondary cities or agropolitan development; regional strategies; and even a laissez-faire approach, which "offers a useful corrective against over-enthusiastic recommendation of costly and ineffective urban dispersion policies" (Richardson, 1977:48), have been usefully analyzed by Richardson (1977), Renaud (1981), Lo and Salih (1979), and others. It is important to bear in mind that, grand strategies aside, removal of the more obvious and inegalitarian cases of urban bias would inevitably tilt the balance of attractiveness more in favor of smaller cities and rural areas—which is not to say that removal of urban bias will be anything other than an uphill struggle against strongly entrenched interests. The strength of those entrenched interests and their power to distort policy are noted in Gugler (1982:188–89; Jones, 1975:114; Stark, 1980; Keyfitz, 1982; and Lipton, 1977. As Todaro with Stilkind (1981:xiii) summarizes it:

> In order to eliminate the urban bias in development policies, three equally dramatic and perhaps unpopular steps need to be taken. The first is to end the special tax breaks, subsidized interest rates, excessive tariff protection, and other privileges enjoyed exclusively by urban large-scale industry. The second is to modify minimum wages by holding them to the level of average agricultural incomes while simultaneously slowing the growth of urban real wages at all levels in both the public and private sector. Third, governments must curtail the expansion of urban public services and instead provide for them in rural towns and small-city service centers.

What specific policies can be suggested to encourage people to remain in rural areas? The literature on agricultural development strategy and integrated rural development programs is too vast to summarize here, but agricultural development of a kind that does not concentrate wealth in fewer hands must be the cornerstone of any such strategy. Lipton (1982:26–29) argues that enhancing rural welfare and equality will almost always retard townward migration, whereas rural economic growth need not do so if it is achieved by means that displace poor rural workers. Any development that raises income levels of the rural poor helps to provide a market for other goods and services. Thus, increasingly prosperous rural areas can support the growth of a wide range of other economic activities, based either at the village level or in nearby market towns or smaller cities.

A second basic element of the strategy concerns public expenditure policies. These should emphasize provision of infrastructure in the form of roads, community centers, better water supplies, and the more widespread dispersion of schools and health centers. Provision of such infrastructure will make a four-way contribution to the strategy of keeping people in rural areas as the economic structure changes. It will make the rural areas more desirable places to live. It will provide in itself substantial new employment opportunities in the rural areas for school teachers, health workers, other government officials, and construction workers. It will upgrade the education and health levels of the rural population, thus enhancing the quality of the rural workforce and hence the attractiveness of the rural areas to those wishing to set up industrial plants. Finally, the rural public works programs, especially if they are timed seasonally to take up the slack in employment, will raise family incomes and lessen the need for poor households to send members to the cities as a risk-minimization strategy. Such programs should not be "make-work" programs but designed to develop key rural infrastructure, such as market roads and tubewells. Larger-scale government investments–for example, in universities and military camps–can also serve the end of regional development.

Rural industrialization also holds considerable potential for retaining population in rural areas and improving household incomes. Here it is necessary to look for conditions advantageous to the development of decentralized small industry. Dixon (1978:77), citing Staley and Morse (1965), notes three such conditions:

1. Locational influences favoring factories processing a dispersed raw material (for example, butter or cheese); factories manufacturing products with local markets and relatively high transfer costs (for example, bottled and canned soft drinks); and service industries with individualized requirements (for example, printing)
2. Process influences favoring separable manufacturing operations with a high degree of specialization; crafts or precision handiwork; and simple assembly, mixing, or finishing operations
3. Market influences favoring differentiated products having low economies of scale (for example, ready-made garments); and industries serving small, total markets (for example, rice milling, glovemaking, making artificial flowers, and so forth).

It should perhaps be stressed that, provided a suitable transportation and communication network exists, rural industries do not have to be restricted to local markets, but can supply urban and export markets as well.

A burgeoning agriculture will provide new opportunities for rural industry. For example, canning of vegetables and fruit for export has become a major rural industry in Taiwan; and tractor-servicing facilities and facilities for repair of pumps and other agricultural equipment are spreading through the rural areas of Southeast Asia. Increased agricultural output can mean more work in processing and in transporting both the output and the inputs needed to produce it.

Employment for women needs to be given special consideration in schemes to expand rural industry, because in countries such as India, Indonesia, and the Philippines, rural women have been displaced from many traditional tasks by recent developments (Jones, 1980:527; Collier et al., 1982; Dixon, 1978:17–25; Roumasset and Smith, 1981: 410–13) and so constitute an increasing reserve of potential rural-to-urban migrants. In South Asia, it is admittedly unlikely that a significant stream of independent female urbanward migrants will develop, given cultural constraints. In Southeast Asia, however, this is certainly not the case, and female migration flows are becoming important (Pryor, 1977; Khoo, forthcoming). Dixon (1978) discusses in some detail schemes for providing employment and income for rural women.

REGIONAL ASPECTS OF STRUCTURAL CHANGE AND URBANIZATION

Reduction of regional disparities is often seen as a way to reduce inequality among individuals and households in a country as a whole, though more direct forms of income redistribution are likely to be more efficacious. In any event, sharp regional disparities in levels of economic growth–much sharper than those in advanced economies–characterize many Asian countries, and lagging regions normally have lower than average levels of urbanization. For example, Northeastern Thailand, where per capita income is less than half the national average and less than one-sixth that of Bangkok, has only 10 percent of its population in urban areas as against a national figure of 23 percent. Other examples include the northeastern and northwestern states in Peninsular Malaysia, especially Kelantan (26 percent urban as against a Peninsular Malaysia figure of 42 percent); the northeastern states of Assam, Nagaland, Bihar, and Orissa in India (less than 10 percent urban compared with a national figure of 20 percent); northern Bangladesh (5 percent compared with a national figure of 9 percent);[7] and the eastern islands–Bali and East and West Nusatenggara–of Indonesia (8 percent compared with a national figure of 17 percent).

Given these regional inequalities, it is important to consider the regional aspects of policies designed to transform the rural employment structure, as well as appropriate regional urbanization strategies.[8] In this context, five types of regions can be usefully distinguished:

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[7] It is noteworthy that this region adjoins the slightly urbanized states of Assam and Bihar in India. Actually, Bangladesh as a whole is slightly urbanized by Indian standards and, if we ignore national boundaries, completes a ring of little-urbanized states (along with Assam, Nagaland, Bihar, and Orissa) encircling the more urbanized state of West Bengal.

(1) The primate city
(2) The metropolitan "shadow area"
(3) Downward transitional zones
(4) Growth-dominated rural areas
(5) Rural areas that have some characteristics of (3) and (4).

The metropolitan "shadow area" tends to be the heaviest contributor of migrants to the metropolis, but it also offers the best prospects for retaining population in rural areas through the development of commuting and circular migration patterns and the location of factories and other large employment-providing facilities (e.g., universities) outside the metropolitan area.

The downward transitional zone denotes settled agricultural areas with low productivity and problems of high population density, continued population growth (partly offset by out-migration), depletion of soil fertility, erosion, etc. Large areas of Thailand's northeast and of Uttar Pradesh in India, Java's southern limestone areas, and much of the Visayas in the Philippines typify such a zone.

The growth-dominated rural area can be subdivided into two kinds—the resource frontier where new land settlement or development of new extractive industries is taking place and service towns are developing as a result (e.g., some of Indonesia's transmigration areas or Malaysia's regional developmental areas), and more settled areas where development of new crops, extended irrigation, and agro-based industries are bringing greater rural prosperity, with accompanying urban growth (e.g., Thailand's Chiangmai Valley, the Philippines' Region 11 centered on Davao City, and the Green Revolution states of northwestern India, particularly Haryana and Punjab).

Strategies for strengthening nonagricultural employment in rural areas of such regions may differ greatly, depending on their special characteristics. Malaysia has been relatively successful in building a prosperous peasantry through FELDA (Federal Land Development

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[8] There is not space here to do justice to the vast literature on regional development and regional urbanization strategy except where it touches directly on the theme of this paper. (For comprehensive studies, see Lo and Salih, 1979; Renaud, 1981; and the references they cite. For an evaluation of policies to date, see El-Shakhs, 1982:147–62.)

Authority) projects in many frontier regions. The key concern now is how to hold the second generation in rural areas, as large family size and strict rules against fragmentation of holdings limit opportunities in agriculture and as increased prosperity, together with the education and heightened aspirations that go with it, further weakens the interest in a farming career (Chan, 1981:415–16). So far, it appears unlikely that the limited factory employment and other jobs available in the newly created service towns will fill the gap. The Philippines in Region 11 has followed a different model, based on plantation agriculture, agribusiness, appropriate rural manufacturing ventures (e.g., a pulp and paper mill), and government investment in infrastructure, including irrigation, power, and transport. Increased rural prosperity has created opportunities for many small business ventures, as well as boosting the growth of the regional city, Davao City.

Perhaps the most intractable problems are raised by the downward transitional zones. The best solution to their problems is not necessarily to try to hold population in them or to force firms to move to them from the capital city. Their local markets may be too small to sustain such development, and their transport and communications systems too weak. On one hand, faster overall national economic growth may occur if substantial out-migration from these zones takes place, to regions of greater opportunity (though in densely settled South Asian countries, few target areas of economic opportunity exist, unless they be the big cities). On the other, appropriate strategies may be feasible to redynamize agriculture in such areas, and they, together with the remittances received from out-migrants, could in time generate a larger local market. Agricultural development strategies could be linked with strategic government investments (e.g., in transportation, communication, and education) and development of regional secondary cities.

A useful case study supporting some of these arguments is Hafner's (1980) study on Thailand's northeast. He argues that the prospects for industrial development, including agriculture-based industrial development, are poor and therefore policies to develop "area development centers" or growth poles will only hasten the process of "urban involution" (McGee, 1967), whereby growing urban populations are absorbed mainly in marginally productive service-sector activities. Without real growth in the agricultural sector leading to increased rural purchasing power, there will be little basis for rapid growth of industrial and service activities in northeastern towns. Provided that the emphasis is on transformation of the rural agrarian sector, Hafner favors the government's new Northeast Secondary Cities Urban Development Policy, by which four northeastern towns are designated as growth centers and will receive infrastructural investments, expanded urban services, and significant fiscal and monetary incentives to encourage industrial development. (For details see Pakkasem, 1977: 393–400.)

SUMMARY AND CONCLUSIONS

Two groups of Asian countries have been the primary focus of this paper. The first consists of the rapidly developing countries such as the Republic of Korea, Taiwan, and Malaysia, where agriculture no longer plays a dominant role in the economy and where the employment transition is being effected in two ways—by the movement of workers from rural to urban areas (normally from agricultural to nonagricultural employment), and by a modification of the occupational structure in rural areas, increasing the share of nonagricultural employment. The second group comprises the poorer countries, the South Asian countries in particular, where the employment transition is sluggish and continued rapid population growth is adding vast numbers to both the rural and the urban workforce. In between is an intermediate group of countries including the Philippines and Thailand.

None of the Western countries at a comparable stage of development had to plan for cities even approaching the size of the largest cities of Indonesia and India; none had the vast rural populations as potential sources of rural-to-urban migrants; none had rates of population growth even approaching those of the countries of the Indian subcontinent. Rates of population growth in the countries of South Asia imply rates of urban growth exceeding 3 percent per annum *even if* the movement of labor out of agriculture is only on a modest scale. Such rapid growth implies a doubling of urban population in, at most, 23 years, and probably a doubling in size of the Calcuttas, Bombays, Karachis, and Jakartas in a much shorter period. A faster rate of economic growth would only mean still faster urbanization, unless the accommodationist trends discussed in this paper are successful.

The contention of this paper is that, although the different groups of countries have different reasons for concern about rapid urban growth, all of them have reason to look carefully at ways of fostering transformation of the employment structure in rural areas in a way that will reduce the tempo of urbanization without losing the benefits usually attributed to urbanization. The countries with the strongest reasons for interest in such policies are the large, poor countries with dense rural populations, which face enormous problems if their cities actually grow as projected. They have good reason to assume that structural transformation of production and employment can be achieved with a lesser or greater tempo of urbanization, and that the outcome is amenable, at least to some extent, to manipulation through conscious policies, some of which have been noted in this paper.

Is it possible to reconcile this argument with those that attribute to urbanization a key role in modernizing attitudes and aspirations, and concentrating in a dynamic way the creativity of a nation? If urbanization is indeed a necessary prerequisite for changes in circumstances and hence attitudes that will give women and children new roles, foster lower fertility and more egalitarianism within the family, lead to more "economic mindedness" and drive, and cause the sloughing off of irrational beliefs and customs, then it could be argued that any attempts to slow the process would inhibit economic and social development. The obvious reply to this argument is that it is not urbanization per se that leads to these changes but rather a number of circumstances that tend to be present in urban areas. The key question, then, is whether these circumstances, or others that achieve similar results, can be captured in rural areas.

There is enough evidence of both the persistence of traditional attitudes and beliefs even in large metropolises (e.g., the Betawi in Jakarta–see Al Hadar, 1982) and the possibility that rural areas actually lead cities in various aspects of modernization (e.g., the faster adoption of family planning and fertility decline in rural East Java than in Java's cities) to throw doubt on any theory of social and attitudinal change that gives primacy to urbanization per se. It seems possible that stresses on development of rural education, communications, community development efforts, and rural industry, linked with the greater pliability of rural populations in the face of strong government programs, could mean that the developmental aspects of urbanization could equally be captured in rural areas.

It would be unfortunate if a failure of imagination were to strengthen the already strong urban biases in the poorer countries of

Asia. If the ultimate vision that Indian or Indonesian planners hold of their densely populated countries 50 years from now is something other than the re-creation of American urban patterns, complete with freeway systems and wasteful consumption patterns, then it is important that the development strategies they design are not locked into patterns apparently designed to produce just that.

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Structural Change and Prospects
for Urbanization in Asian Countries,
by Gavin W. Jones
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Table 5, page 17: Heading over columns showing years should be "% of labor force in nonagriculture ÷ % of population urban × 100."

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Urban growth and local taxes in less developed countries

Roy Bahl,
Daniel Holland,
and Johannes Linn

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PREFACE

This paper was first prepared for presentation at a conference on urbanization and national development at the East-West Center January 25–29, 1982. In its first version, it appeared as Occasional Paper No. 57 of the Metropolitan Studies Program of The Maxwell School of Syracuse University.

ABSTRACT The rapid growth of large cities in developing countries has aroused the interest of government planners and international donors, particularly with respect to how policy measures can be used to curb this growth. This paper takes another view: If rapid urbanization is inevitable, how might the accompanying growth in taxable capacity best be captured by local governments? The paper begins by describing a model that relates urban growth to fiscal need and taxable abilities. Attention is then turned to a description of the practice in the taxation of the three major urban tax bases: property taxation, automotive taxation, and sales and income taxes. The focus of the analysis is on the possibility of capturing increased revenue from these bases, given the legal, institutional, and economic constraints that inevitably face local governments in developing countries.

URBAN PUBLIC FINANCE in less developed countries (LDCs) has not been widely studied. Much of what has been done is case studies, designed to resolve specific tax policy problems. With the notable exception of Lady Ursula Hicks (1961, 1974) and, more recently, K.J. Davey (1983), few scholars have bothered with a conceptualization of the problem or with broad comparative analysis. The reasons for this neglect are not hard to find. First, the local government sector in LDCs is relatively small. Second, central government fiscal planners have long been preoccupied with the fiscal contributions and responses to stabilization, slow economic growth, and industrialization. In short, the real action simply has not been in the local government department of the ministry of finance or in the ministry of local government.

Things are changing. Cities in LDCs are growing at enormous rates, and urban areas are contributing both a heavy share of GNP and a new set of social problems (congestion, pollution, crime). As a result, there are few countries in which regional allocation considerations are not part of the long-term development plan. Many of these regional development plans are of fairly recent origin and most point toward the use of government policy to slow the growth of large cities; that is, they are decentralization programs. In other cases, the policies accept the inevitability of urban growth and attempt to strengthen the ability of cities to absorb in-migrants. These might be referred to as "accommodationist" policies. It is in this context that the role of local government in the development process–Lady Hicks's *Development from Below*–has been rediscovered.

This paper considers local tax policy as an instrument for accommodating the population and economic growth of cities in developing countries. First, we suggest the magnitude and nature of the urban growth that must be absorbed, the problems it has raised, and the policy setting in which local governments operate. Second, we offer the crudest of models to consider the kinds of effects that urban growth imposes on the local government fiscal system. Finally, we turn to a survey of the practice and problems with urban property, automotive, and business taxation, the three major local government tax sources in LDCs.

THE GROWTH OF CITIES

Many observers and policy analysts are alarmed at the current rate of urbanization in LDCs and at what seems likely for the rest of the century. It has been estimated that by the year 2000 the cities of LDCs will absorb 70 percent of projected population increases–1.3 billion people–most of them poor (Beier et al., 1975). This growth will more than double the 1975 population of cities in LDCs. The concerns raised about this growth are often more impressionistic than real and seem to be based on a notion that people in cities create special problems that would not have been so serious had migration not occurred. Four dimensions of urban growth in LDCs seem common to most urban "problems" discussions: migration, the size of cities, motorization, and poverty. These four dimensions offer some important opportunities, and constraints, for rethinking the role of urban tax policy.

Migration

Migration has accounted for about half of urban population growth in recent years, with a wide variation across countries and even among cities within countries (United Nations Commission on Human Settlements, 1979). There is good reason to expect this pattern to persist in the next several decades. Natural population growth in urban areas will continue to be quite high because of the young age of the population, and there is no sign of a slowing of the rate of migration to cities. The continuation of rapid growth of cities seems inevitable.

As for the public finance questions raised here, it is not simply the number, but also the characteristics of in-migrants that are important. Most surveys show that migrants from rural areas are, on average, younger, better educated, more skilled, and more adaptable to urban life than are those who did not migrate (Goldstein and Goldstein, 1981). Even so, average rural-urban income disparities are quite large, and the new arrivals are poorer than the average resident. Moreover, the in-migrants contribute to an already acute shortage of jobs, housing, and public services.

City size

A second problem that concerns many government planners is the sheer size of cities. For example, Mexico City, whose population is now about 15 million, could have more than 30 million inhabitants by the year 2000 if growth rates of the 1970s continue, more than 20 million if there is no net in-migration. Most of the largest cities in the world will be in developing countries at the end of the century. Relatively little is known about how one manages urban areas of this size; for example, are there diseconomies of scale in the provision of urban services?

Motorization

Congestion and pollution underlie much of the concern about the problems related to the growth in cities. This in turn may be linked to the growth of slums and the growth in motorization. Automobile registration has grown much faster than population in developing countries (and is highly concentrated in cities) and has placed strains on urban governments for roadway development as well as for controlling congestion and pollution.

Poverty

Growing urban population is often treated as synonymous with growing urban poverty. In fact, the relationship between urban poverty and urban growth is not so straightforward. There are no good data on income distribution, unemployment rates are not well measured, and underemployment rates are pretty much unknown. About the only surrogate measure that can be used is the percentage of population living in slums, and even here there are serious problems with making intercity comparisons. Moreover, while 50 percent of urban population living in slums or substandard housing is not all that unusual, the relationship between the concentration of the poor and urban population growth is not at all clear and probably varies from urban area to urban area.

THE URBAN FISCAL PROBLEM IN LDCS

This rate and quality of population growth has led to a number of problems in the cities. Lady Hicks (1974) sees these as including

1. in-migration
2. congestion and pollution
3. administrative problems
4. shortage of finances
5. deficient levels of basic services
6. shortage of moderately priced housing
7. unemployment
8. deficient educational backgrounds.

She sees the first four of these as common to metropolitan areas everywhere, the last four as being unique to metropolises in LDCs.

Johannes Linn (1979:5) boils the same set of concerns down to two propositions:

> . . . that urban labor supply tends to expand more rapidly than urban labor demand, thus limiting urban employment opportunities. . . . and that the demand for urban services, including transportation, housing, and public services, expands more rapidly than their supply. . . .

Linn's second proposition is the popular notion of the urban fiscal problem as a major concern related to "excessive" city size. The question we raise is whether and how urban fiscal problems are exacerbated by city population growth. In fact, the public finance implications of urbanization in developing countries are much less clear than the casual observer might expect. That urbanization does pressure public expenditures upward is widely recognized. Less often discussed is the revenue side effect; that is, urban growth may well be contributing a substantial amount to the financial resources of urban governments. Local governments may be failing to draw on these resources, but the potential is there. In short, urban growth is more of a mixed blessing than most analysts have taken it to be.

Model

We might begin the process of modeling urban fiscal balance by assuming away the normative questions of the optimal level of central and local government taxation and the optimal local government share of total government resources. This analysis (using a model adapted from Bahl and Linn, forthcoming) is positive in that we are concerned only with the actual and potential effects of urbanization on local government fiscal balance.

In order to examine the fiscal implications of urban growth in developing countries, we may postulate the following model: Define some subjective measure of expenditure "needs" for the *i*th service ($\hat{E}_i$), and compute total expenditure needs as

$$\sum_i \hat{E}_i = \sum_i \frac{\hat{E}_i}{\hat{Q}_i} \frac{\hat{Q}_i}{P} P = \sum_i \hat{e}_i \hat{q}_i P \tag{1}$$

where

$\hat{Q}_i$ = required quantity of service i
P = population
$\hat{e}_i$ = unit cost of required services
$\hat{q}_i$ = required quantity of services per capita.

Actual expenditures ($\hat{E}_i$) and quantities ($\hat{Q}_i$) are

$$\Sigma E_i = \Sigma \frac{E_i}{Q_i} \frac{Q_i}{P} P = \Sigma e_i q_i P \tag{2}$$

Local government revenues (R) are

$$R = \Sigma R_j + G = \Sigma \frac{R_j}{Y} \frac{Y}{P} \cdot P + G = \sum_j r_j y P + G \tag{3}$$

where

G = external grants
Y = income
y = per capita income
r = average effective tax rate for jth tax.

We may further expand the right side of (3) to

$$\Sigma r_j y P = \Sigma ctbyP + gP \tag{4}$$

where

c = collection rate
t = statutory tax rate
b = tax base as a percent of income
g = per capita external grant.

We may define the real fiscal deficit ($\hat{D}$) as

$$\hat{D} = \Sigma \hat{e}_i \hat{q}_i P - \Sigma c_j t_j b_j y P - gP = P[\sum_i \hat{e}_i \hat{q}_i - \sum_j c_j t_j b_j y - g] \tag{5}$$

Now the relevant question becomes how population growth affects each of these determinants of fiscal balance.

The growth of very large cities, however, involves far more than simple population increase. The market conditions sufficient for the growth of large cities include (1) economies of scale, (2) the ability to substitute capital and labor for land, and (3) strong interindustry linkages (Mills, 1982). To the extent that economies of scale extend to the public sector, e_i is reduced and $\hat{D}$ is dampened. The substitution of capital and labor for land raises productivity and factor prices (e_i), raises population density and $\hat{q}_i$, but also raises land values, hence increasing b. Strong interindustry linkages imply a growing formal sector, hence a more easily taxable base and an increase in b. The net impact of these revenue and expenditure effects on $\hat{D}$ is unclear.

In keeping with the revenue focus of this paper, we may associate "urbanization," or growth in city size, with characteristics meant to identify the quality of population growth. Following Mills's analysis, we may define increasing per capita income (Y) and an increasing formal sector (F) as two features of urban growth. Further, we may take the process of urban growth (U) to include not only increasing population (P), but also migration (M), motorization (A), and increasing concentrations of poverty (V); that is,

$$U = f(P, M, A, V, F, Y). \tag{6}$$

Using this simple framework, we might ask about the effects of various patterns of urban growth on urban government deficits.

Much of the literature has implicitly used such a model, for example, in suggesting or implying that migration pressures urban government budgets. The argument is usually that

$$\frac{\partial \hat{D}}{\partial M} = \frac{\partial \hat{D}}{\partial \hat{q}} \cdot \frac{\partial \hat{q}}{\partial M} > 0 \tag{7}$$

because both the quantity effect ($\partial \hat{D}/\partial \hat{q}$) and the migration effect ($\partial \hat{q}/\partial M$) will bid up expenditures. This, of course, assumes away the possibility that there will be or can be an offsetting revenue effect, for example, that b_j might increase with migration and motorization or that g might rise with in-migration. We would not suggest that the revenue effects of urbanization are fully offsetting of incremental costs, but they may be stronger than usually thought and ought to be considered. In that urbanization drives up property values, income earned, the number and sales of local businesses, and the number of cars and trucks, it also increases the taxable capacity of the local government.

URBAN PROPERTY TAXES: PRACTICE AND PROBLEMS

In theory, increasing urbanization should increase revenues from the local property tax. As land runs short, the housing stock is expanded, and as commercial and industrial activities grow, property values also grow. Indeed, urban property values may well have grown as fast as urban public expenditure requirements, but property tax revenues clearly have not. The evidence suggests that urban property tax revenues have not kept pace with the growth of the base, largely because of the way the tax is administered in most developing countries. Assessment practices are inadequate, there is a great shortage of professional expertise in the valuation area, collection problems are severe, and taxpayer resistance to higher taxes on property is to be counted on. To understand better the failings of the property tax in capturing the revenue benefits of urban growth, it is necessary to turn to a brief statement of the existing practice in developing countries.

The practice

In principle we can describe three basic forms of property taxation: annual or rental value systems, capital value systems, and site or land value systems (for a more detailed comparison of practices, see Bahl, 1979). All are used in developing countries. In the first, the property tax rate is assessed against annual rental value; capital value systems use some proportion of the market value of property (both land and improvements) as the tax base; and site value systems are based on the market value of land, excluding improvements.

While this trichotomy in the property tax base is a useful point of departure, a classification formulated in the legal tax base greatly oversimplifies and does not necessarily identify "similar" systems. In practice, there are many more than three systems and these are differentiated by varying inclusions in the base, different rate structures, and perhaps most important of all, different assessment practices. In a sense, each country/city implants its own style--its cultural values and a unique set of political considerations–on its property tax system. As a result, it is not possible to point to any one of these basic systems as clearly superior, though it is possible to identify specific practices that have favorable or unfavorable effects.

Annual value property tax systems, more or less resembling the British rates, are still used in most countries colonized by the United Kingdom. However, there are assessment problems (particularly with respect to industrial and owner-occupied residential property) that have prompted a switch to something resembling a capital value system. Indeed, perhaps the most significant feature of existing annual value systems is that all resort to some use of capital value assessment. There is little evidence of a trend toward annual value and away from capital value systems, and the capital value base does not resort heavily to assessment on a net rent basis.

There appears to be much more diversity among cities using capital value systems than among cities using annual value systems, with respect both to tax structure and the effectiveness of the practice. At least in intent, there are many common features in the use of capital value systems. The more important of these features, which also distinguish the capital from the annual value system (and from the capital value system in developing countries), are (a) a differential tax treatment of land and improvements; (b) an objective assessment practice for residential properties; and (c) a uniform assessment procedure for various types of land. Though there is much diversity in specific practices, there is a tendency for capital value systems to involve central and state government more heavily, especially in the assessment function.

In the last analysis, the capital value system is probably gaining in popularity because the concept of the sales value of property is more easily understandable and would appear to be more measurable. There lies the rub. Property value assessment and reassessment are highly technical matters and require a staff of substantial size and skill. The shortage of valuers in developing countries is acute, and governments have to make do with inadequately trained personnel, contract out, or simply not reassess.

Site value property tax systems are attractive in theory since, unlike either annual value or capital value taxes, the site value levy would have an income effect but no allocation effect. With the amount of tax invariant with respect to the degree of development on the land, the tax would raise revenue and not alter the pattern of development that would otherwise have occurred. Capital value taxes, however, levied on both land and the development thereon, tend to deter the degree of development.

Thus, site value taxation (SVT) has also been supported because it leads to more dense development than does capital value taxation (CVT) and therefore means lower government expenditures on certain urban infrastructure–streets, sewer and water lines, electric wiring, etc. An additional reason for preferring site value taxation has been the belief that, as compared with capital value taxation, the site value base will be more effective in energizing "sleepy" holders of vacant land, inducing them to develop or sell to others who will.[1]

Can we expect more from the property tax?

In a reflective essay, Carl Shoup has raised the question: "why so modest is the use made of the urban real estate tax in less developed countries . . . ? (Shoup, 1979:272). There are, as we have already noted, formidable administrative obstacles to property taxation. But Shoup does not emphasize them in answering his own question.

To explain why the potential of the tax is not drawn on, he thinks economists are at a disadvantage because sociology and political science and perhaps some anthropology must be called on to explain why this great reservoir of finance for urban progress is, with few exceptions, being tapped at a rate far below what to most of the outside observers seems quite practicable and desirable (Shoup, 1979:272–73).

In particular, Shoup finds a primary reason for the unsalutary

---

[1] Designating the value of land in the taxing jurisdiction as L and the value of improvements as I, and required revenue (the same under either tax) R, the rate of site value tax λ, and of capital value tax α, then:

(1) Under the capital value tax: $R = \alpha(I + L)$
(2) Under the capital value tax: $R = \lambda(L)$, and

$$\lambda = \frac{\alpha(I + L)}{L}.$$

Therefore the site value tax will always be levied at a higher rate than the capital value tax, the difference between them being determined by the ratio of improvements plus land to land.

If, for example, L is one-fourth of total value and I is three-fourths, then $\alpha=1$ and $\lambda=4$ would raise the same revenue from their respective bases. On a vacant plot, however, the tax liability would be four times as large under SVT as under CVT. On an "average" property, i.e., one with L equal to one-fourth and I equal to three-fourths of total value, the tax liability would be the same under both bases, and for a property developed to a greater extent than average, the tax liability would be less under SVT than CVT.

neglect of the property tax base to lie "in the pattern of ownership of urban real estate in most developing countries" (Shoup, 1979:273). Not much commercial real estate is owned by the large domestic and foreign corporations that can be taxed at relatively little political cost. A heavy proportion is owned by important government officials and their families, and the substantial urban residential properties tend to have similarly influential owners. Lacking is a substantial proportion of middle-class housing. Thus, Shoup sees the tax base divided between "the politically nontaxable mansions and luxury apartments in high-rise structures, on the one hand, and the shanties of the poor that are not worth trying to tax, on the other."

Another reason for the "underdeveloped" property taxation in developing countries is the heavy reliance on the central government for the provision of public services such as education, police and fire protection, and roads. Shoup notes that the rich can afford to buy these services in the private market, and the relatively large middle-class demand that would be more effectively met by their finance in the public sector has not yet developed. If and when it does, real property taxation may be more heavily availed of.

Another factor noted by Shoup is the imperfect land-tenure and leasing arrangement, which makes valuation more difficult. And, finally, he points out the obstacles posed for property taxation by high and endemic rates of inflation. Property values are perpetually out of date, the dispersion of assessed around true values becomes more pronounced, and taxation, in effect, of unrealized gains poses still further difficulties to successful property taxation.

In the face of this formidable list of difficulties, is there any real prospect that property taxation will have a more appropriate role in urban finance in developing countries? Clearly this listing of obstacles suggests that it would be fruitless to look for a sharp improvement from a major reform or a particular device.

Some have urged, for example, that the formidable administrative obstacles and costs of property taxation could be circumvented by a scheme of self-assessment under which the taxpayer would set the taxable value for his property with the obligation to sell it for that price (or that price plus a premium) or pay a penalty based on that value if it should turn out to be too far below some minimum. But the success of such a scheme rests on a credible threat, and the factors cited from Shoup suggest the difficulty of mounting such a threat.

Moreover, even were self-assessment "practical," there is good reason to believe that it would exact a differential penalty from the relatively poor and the relatively poorly informed (Holland and Vaughn, 1969).

If there are no panaceas, what are the prospects, what can we reasonably expect and seek to accomplish?

For one thing, we can be more realistic. We should not exhort, encourage, or expect "substantial real estate tax in a country where tradition, custom, mores, political and power structures, and similar influences stand opposed to such a levy. What is badly needed is to know how to improve and evaluate the tax in those urban areas where it has taken firm root and could be, perhaps, transformed into a powerful engine of urban development" (Shoup, 1979:282).

For another, we should remind ourselves that change in urban public finance, as in so much else of human affairs, consists of slow, small, and uneven adjustments "such as the creation of special districts for capital cities with special expenditure responsibilities and revenue authority (Bogotá and Seoul); enlargement of metropolitan jurisdictions by annexation of adjacent municipalities (Bogotá); gradual development of new revenue sources (betterment levies in Colombian cities, land readjustment schemes in the Republic of Korea, and vehicle taxation in Jakarta); minor reassignments of expenditure functions (Kenya and Zambia). . . . " (Linn, 1980b).

Finally, we should encourage simplification of property tax design and objectives. Casual observation of the structure of property taxes in developing countries suggests a major difference from the practice in the United States. The cities in developing countries tend to use property taxation to induce allocative effects, that is, to discourage land speculation, promote the decentralization of metropolitan population, encourage housing maintenance and urban renewal, encourage higher buildings, and encourage home ownership. These features have been built into property tax systems in a variety of ways, including marginal adjustments in the property tax rate structure and assessment practices and through the institution of specific property tax coercive measures.

But these are triumphs in principle that do not get translated into practice. The special features are rarely implemented. They stand as a statement of intention, not accomplishment. And they may well do more harm than good because they suggest "we are doing something" and therefore tend to forestall more constructive efforts.

There simply is no hard evidence to suggest that these efforts to induce allocative effects actually work. Yet the practice in LDCs suggests that decision makers in many developing countries believe that such an effect can be induced. In any case, there is need to evaluate these benefits against revenue and equity costs and to rethink the use of such adjustments in terms of whether offsetting or reinforcing effects exist elsewhere in the property tax structure. One cannot achieve too many objectives with the same tax treatment; and one can hamper the achievement of a single primary objective by surrounding it with gingerbread.

We turn next to a promising new local government tax base that illustrates the strong relationship between revenue and allocation effects.

AUTOMOTIVE TAXATION

Motor vehicle ownership and use represent an excellent, but neglected, tax base for urban governments in LDCs (see also Linn, 1980a). The automobile population growth is more rapid than the city population growth in many cities, automobile ownership and use are easily taxable, and such taxes are likely to fall on persons with higher incomes. On the negative side, the growing automobile population increases urban government revenue needs by increasing expenditure requirements associated with road use and imposing considerable external costs of congestion and pollution on the urban environment. Much more attention has been focused on these costs than on the fiscal instruments that urban governments might develop to utilize this important revenue base and to control the high costs of urban congestion. A major difference between automotive taxes and all other local government taxes should be noted at the outset. This is the one case where efficiency objectives are as important as revenue-raising objectives, a factor that leads policy analysts to worry at some length about tax policy effects on road use and automobile ownership. Fortunately, automotive taxation in urban areas provides one of the rare examples where the benefit and ability-to-pay principles of tax policy converge.

The data in Table 1 show the degree to which the growth in the number of registered automobiles has exceeded that of population, for a sample of LDC cities, and suggests that the overwhelming proportion of the total urban motor vehicle fleet is made up of automobiles. Furthermore, comparing automobiles and populations in urban

TABLE 1. Rates of growth of population and automobiles for selected LDC cities

City	Rate of growth of population, 1960–70	Rate of growth of automobiles, 1960–70
Calcutta	2.2	7.2
Bombay	3.7	8.2
Madras	4.5	5.8
Seoul	8.5	22.0
Jakarta	5.3	8.8
Hong Kong	2.9	7.1
Bangkok	6.2	12.0
Singapore	2.6	6.7
Kuala Lumpur	6.5	11.3
Mexico City	5.8	10.5
Caracas	5.4	8.3
San Jose	5.4	10.9
Istanbul	6.0	12.2
Lagos	7.9	15.5
Tunis	2.5	6.0
Beirut	2.9	9.1

SOURCE: World Bank (1975: Annex 2).

areas with national totals shows that car ownership is heavily concentrated in the largest cities of developing countries (see also Smith, 1974:329–88). For example, in 1970, Bangkok had 8 percent of the national population and 83 percent of the nation's cars. Comparable figures are 7 and 57 percent for Seoul, 15 and 65 percent for Tunis, but 17 and 16 percent for Paris. These trends of growth and concentration are likely to persist with continued expansion of urban populations and income increases. This pretty much makes the case for automobiles or automobile use as a viable tax base.

Associated with the rise in the urban motor vehicle fleet is the increase in investment and maintenance requirements for street infrastructure and traffic management. That more cars will increase the pressure for more road and street expenditures is only half the story. The unit costs of these services are also likely to rise with increasing congestion and land prices in central urban areas and with increases in the relative price of materials (e.g., asphalt, concrete).

Besides these two reasons for taxing motor vehicles–the base is there and increased numbers of cars generate revenue needs—there are the strong efficiency arguments for controlling the use of motor vehicles in urban areas. Traffic congestion and air and noise pollution are as bad, or worse, in many of the cities of developing countries as in the industrialized nations. And while it may be argued that higher congestion and pollution levels are likely to be more acceptable in the LDC cities than in the cities of developed countries, there can be little doubt but that the actual levels of congestion and pollution observed in most of the large LDC cities are far beyond optimal levels. Perhaps more important, things are likely to get worse in the years ahead.

This presents a quandary. If local governments are successful in using automotive taxes to reduce congestion and pollution, they will dampen the revenue productivity and elasticity of the tax base. On the other hand, there are considerable benefits to reducing congestion and pollution. Some of these benefits, reduced street and traffic related expenditures, accrue to the local governments. Other benefits, time savings and healthier air, accrue to the private sector rather than to the local government. Therefore, the decision to tax so as to selectively discourage road use rather than to maximize revenue yield from the automotive base may reflect the local government's view that controlling congestion and pollution is a higher goal. The choice to tax so as to discourage congestion implies a different automotive tax schedule than would taxation to maximize revenue.

Local automotive tax practices in LDC cities

Despite this seemingly excellent case for local taxation of urban motor vehicle ownership and use, urban governments in LDCs are not universally authorized to levy such charges. For instance, in Manila local authorities are expressly enjoined from levying any taxes or fees on motor vehicle registration. Where governments can impose taxes on motor vehicles or fuel consumption, they generally have not made a major effort to tap this revenue source at anything like its full potential. Comparative studies have shown that it is rare for automotive taxes to contribute more than 10 percent of total local revenue (Jakarta and Guatemala City are exceptions),[2] or even more than 10 percent of total local tax revenue (Tehran, Valencia, and Seoul).

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[2] A third city, not shown in Table 2, where automotive taxes apparently play a major role is Cairo. There they have contributed as much as 27 percent of local revenues in recent years.

However, especially the example of Jakarta underlines that automotive taxation, if turned over to local authorities and if given sufficient attention, can make a major contribution to local revenues even in an environment not otherwise outstanding in fiscal or administrative achievement (Linn, Smith, and Wignjowijoto, 1976). Thus, while in all cities for which detailed revenue and expenditure data could be assembled, the expenditures on urban roadways by far exceeded revenues from automotive taxes, in Jakarta the reverse held true, with motor vehicle tax revenues exceeding road-related expenditures by 120 percent (Table 2). Although there is no presumption that on economic grounds total municipal expenditures on the urban road network should equal the revenues collected from road users through automotive taxes, the general revenue shortages of local urban authorities in LDCs, which in part are due to an insufficient use of local automotive taxes, lead to a generally poor record on urban road investment and maintenance.

The practices in selected developing countries and cities—as reported in Bahl and Linn (forthcoming)—reveal that local automotive taxation consists of a very heterogeneous set of levies. In most cities where local authorities are permitted to levy automotive taxes at all, this takes the form of annual license taxes levied on all motor vehicles whose owners reside in the particular taxing jurisdiction. In some cities, a one-time tax is levied at the registration of a motor vehicle. In two cities, a local fuel tax was imposed by local governments. Finally, only in Singapore has an effort been made to apply restrictive licenses according to time and area of road usage within the city. Singapore also appears to be the only city in this sample where parking fees have been introduced and collected at more than a nominal level. Tolls on urban roads are not widely used.

The unrestricted local license taxes fall into three major categories: In Guatemala City, Ahmedabad, and Honduran municipalities, flat annual taxes are levied, differentiating only by type of vehicle. In Colombian and Korean cities and in Bombay, the tax varies not only with type of vehicle, but also according to weight. In Jakarta and in the South Korean cities, the tax varies according to type of vehicle and cylinder size. In addition to these three basic types of annual license taxes, there are special features in a number of cities: In the Republic of Korea, the local license tax is lower for business than for nonbusiness use, and for large cars the tax varies with axle length. In

TABLE 2. Revenues from local automotive taxes as a percentage of expenditures on urban roads: selected cities

City	Percentage
Ahmedabad	19.2
Bombay	19.0
Cartagena	7.2
Jakarta	220.2
Kingston	0.0
Manila	0.0
Seoul	36.2
Tunis	0.2

NOTE: These data are for various years between 1970 and 1973.
SOURCE: Bahl and Linn (forthcoming).

Bombay, higher taxes apply to vehicles not equipped with pneumatic tires. In Bogotá, the license tax declines with the age of the vehicle. Finally, in Colombian and South Korean municipalities, buses are charged according to the number of seats.

In contrast to annual license taxes, registration fees and transfer taxes are levied whenever the title to the motor vehicle changes hands (Bogotá, Cartagena, Jakarta), or only once at the time of initial registration (Tehran). In the Colombian cities, the registration fee appears to be nominal (less than US $1) and is presumably intended only to reflect the administrative cost of registration. (The illustrative data reported here and below are for the mid-1970s and taken from Linn, 1980a.) In Jakarta and Tehran, however, the registration "fees" are clearly in the nature of taxes, since they amount to a sizable proportion of vehicle value in Jakarta (10 percent for initial title transfer and 5 percent for any subsequent transfer) and to a flat charge of approximately US $44 for the initial registration of cars, taxis, and buses in Tehran (half that amount for trucks).

In those cities where local fuel taxes apply, they are usually levied on a specific basis–US $0.42 in Singapore, US $0.02 in Guatemala City, and a nominal US $0.0016 in Bogotá–and generally apply only to gasoline. The case of Singapore is exceptional since the fuel tax is a combination of a local and national tax, but it is of interest that

Singapore had one of the highest national gasoline tax rates in a sample of 48 LDCs surveyed by Smith. In the Philippines, cities and municipalities could impose a tax on gasoline up to 25 percent of the national gasoline tax up till 1974. In the Manila Metropolitan area, different percentage rates applied in the various local jurisdictions, varying from 0 to 25 percent of the national tax.

The case of Singapore is, however, even more exceptional since it is the first city in the world (that we know of) that has made a significant effort to restrain central city congestion by the application of area- and time-specific licenses and parking charges. The scheme was initiated in June 1975 and was monitored extensively by local officials and World Bank staff (Watson and Holland, 1978). In essence it consists of prescribing a restricted zone in the city which is defined to include the most congested central business districts, covering 62 hectares and having 22 entry points. Between 7:30 and 10:15 A.M. entry into this restricted zone by private automobile is permitted only if the vehicle exhibits a license which is sold at US $26 a month or US $1.30 a day. Buses, commercial vehicles, motorcycles, and car pools (i.e., cars carrying four persons or more) are exempt. This scheme was supplemented by a drastic increase in public and commercial parking fees. In addition, fringe parking lots were opened up with park-and-ride schemes to offer motorists an alternative form of transportation.

Objectives and yield potential

Automotive taxes may serve multiple objectives, and there are several tax instruments that might be used to emphasize one objective over another. The simple cross-tabulation in Table 3 is suggestive of the possibilities and underlines the need for a coordinated approach to developing an integrated automotive tax structure. First, efficiency and revenue-raising goals may overlap; for example, if the price elasticity is known to be quite low, the primary objective of fuel taxes will be to increase revenues. Second, the central government may have yet other objectives in taxing automobiles, for example, to channel private savings into more socially productive investments, to reduce imports in order to address balance-of-payments problems, etc. Third, each of these instruments can and has taken on many forms; for example, fuel taxes may vary by location or vehicle type depending on the efficiency versus the revenue objective of the local government.

TABLE 3. Objectives of automotive taxation

	Types of taxation							
	Direct taxes on ownership				Indirect taxes on use			
Objective of taxation	Import duties[a]	Sales tax[a,b]	Registration fee	Transfer tax	Fuel	Toll, area license	Sales tax on tires, parts	Parking fees
Reduce road use, congestion, pollution; or charge road user for social costs					X	X		X
General revenue instrument	X	X	X	X				
Instrument of energy policy			X		X			
Income redistribution	X	X						
Restrict automobile ownership	X	X	X				X	

a. Central government

b. Including excise on domestic production.

One view is that the efficiency goal is the primary criterion for evaluating the success of automotive taxation. The efficiency effect of automotive taxes depends on how far they are able to approximate the marginal costs imposed by the use of the motor vehicle. This marginal cost includes the variable maintenance and pollution costs and the marginal social costs of congestion, that is, the increased operating cost, time losses, noise, foul air, etc., imposed on society by the additional vehicle on the road. If automotive taxes are imposed to exactly equal these marginal costs of vehicle operation, then they will produce an optimal efficiency of road use. If, on the other hand, these taxes exceed or fall short of marginal social cost, then road use will be inefficiently restricted or expanded, provided only that the price elasticity of demand for road space is greater than zero. Obviously these marginal costs cannot be exactly measured, but they can be closely enough approximated to generate a set of tax rules or guidelines.

Even so, few would believe that automotive taxes are perfect benefit charges, and one might be left to consider pure fiscal impacts. Increased automobile use will increase $\hat{E}$ and E in equations (1) and (2) above and will raise the size of the public service deficit ($\hat{D}$). Our question is: What is its potential for also increasing revenues and thereby offsetting this deficit?

The revenue performance of various types of automotive taxes has been mixed.

Local government taxes on motor fuels have excellent revenue potential, though they are usually levied at inordinately low rates. Linn has estimated, for example, that in Guatemala City an increase of the fuel tax from the existing rate of 2 US cents to 10 US cents in 1971 would have made fuel tax the most productive local tax and would have increased local tax revenues by some 50 percent. In Bogotá, the increase of the local gasoline tax from 0.16 US cents to 10 US cents would also have made the gasoline tax the most important local tax, with revenues almost double those of the property tax, and would have raised local tax revenues by more than 100 percent. The revenue elasticity of this tax depends crucially on whether it is levied at a specific rate or *ad valorem*. In the former case, tax revenues are likely to be quite inelastic, especially where inflation rapidly erodes the real value of the specific tax,[3] and when gasoline consumption is not growing. In the latter case, however, tax revenues are likely to be quite buoyant, given the rising price of fuel. What is more, fuel tax revenues are likely to be quite stable, since motor vehicle use is not likely to vary much with short-term fluctuations in economic activity.

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[3] In Bogotá, per capita gasoline tax collections in constant prices declined between 1961 and 1972.

Besides the excellent revenue potential, fuel taxes have the great advantage of being relatively easy to administer, especially where the production and wholesale distribution of fuel is in the hands of a government-owned enterprise, as is the case in many developing countries. *Ad valorem* taxes are more difficult to administer and police than specific levies because of the possibility of evasion, especially at the retail level. This explains the general preference for specific fuel taxes in LDCs at the national and local level. There is finally the issue of whether higher-level governments are likely to be willing to let local authorities share in such an important revenue source The fact that few local governments actually levy a fuel tax may lead to some skepticism on this score. The example of Jakarta confirms this: In 1969, the local authorities imposed a local fuel tax at a rate of approximately one US cent per gallon. Other local governments in Indonesia followed suit, but within a year the national government had taken over the tax (Linn, 1977).

Local government sales and transfer taxes on motor vehicles would increase the price of the vehicle and the cost to the purchaser. This would have three effects. First, it may restrict ownership to the extent the demand for automobiles is price elastic. In this way, road use might be indirectly limited. Second, the higher price of the car would increase its annual cost to the purchaser and its use to the extent depreciation is linked to use. Third, it would generate increased local government revenues. The uncertainty is the magnitude of these effects.

On the revenue side, an important consideration is that it is likely to be quite difficult to administer higher local sales taxes on automobiles in urban areas, since the potential for evasion is considerable. Automobiles may be purchased in jurisdictions with lower tax rates, or out-of-town addresses may be given if the tax is linked to the residence of the purchaser. The incentive for evasion is likely to pose a much greater problem in the case of sales taxes than for annual license taxes. This may explain why local governments have generally been given access to license taxes, but only in rare cases to sales taxes on automobiles. An exception is Jakarta (Linn, Smith, and Wignjowijoto, 1976). Both sales and license taxes are levied by the local government, and approximately equal revenues were derived during the fiscal year 1972/73. The average transfer tax per new motor vehicle was calculated to equal US $89. For the annual motor vehicle license tax, the average tax per vehicle registered in Jakarta was US $16. In view of the relatively high tax rate of the transfer tax (10 percent of value for a new vehicle, 5 percent for a used vehicle), the average tax rate is low, reflecting in large part the high degree of evasion that occurs. In fact, the well-known widespread evasion of this tax was one of the major reasons given by local officials for the decision to decrease the legal tax rate in 1971 (from rates of 20 and 10 percent, respectively). In contrast, the administration of the annual license tax appears to work effectively, and evasion does not seem to be a major problem.

The revenue potential of a local automobile sales or transfer tax could be substantial; for example, in Jakarta the transfer tax accounted for 22 percent of all locally raised revenues, with a respectable income elasticity of about 1.5.

In general, therefore, one would conclude that motor vehicle sales taxes are not on a par with fuel taxes or annual license taxes as a local government revenue source. Both of the latter have the advantage of being more easily administered, permitting a greater degree of regional differentiation, and neither results in unfair windfall gains to current motor vehicle users.

Unrestricted annual license taxes are levied according to residence in the area, rather than according to use of the motor vehicle. This tax, therefore, does not affect the use of a vehicle once it has been purchased; however, the decision on whether or not to own a motor vehicle is affected by the license tax, since the annual cost of ownership will increase. This means that unrestricted license taxes may reduce automobile expenditure requirements in the public sector, but the more important fiscal effects are likely to come on the revenue side.

The revenue success with license taxes depends largely on how the tax is structured. As with the local fuel tax and the motor vehicle sales tax, the problem of evasion arises. In the case of the annual license tax, vehicle owners may escape the tax by registering these vehicles in low-tax jurisdictions. This limits the degree to which license taxes can differ, especially between adjoining jurisdictions. However, there is reason to believe that with vigorous enforcement and sizable penalties, some differentiation without major evasion is feasible. The example of

Jakarta tends to confirm this conclusion. Penalties of 100 percent of tax liabilities have been effectively applied in the case of attempted tax evasion, including confiscation of the vehicle where other means of enforcement have failed. In Bogotá, it is claimed that many of the city residents register their vehicles in surrounding jurisdictions. However, the main reason for this evasion does not appear to lie with higher license taxes in the city than in the rural areas, but rather with the long waiting times and the amount of red tape associated with obtaining the annual license in Bogotá.

In their effects on revenue performance, annual motor vehicle license taxes can make considerable contributions to locally raised revenues in LDC cities. In Jakarta, the motor vehicle license taxes accounted for approximately 25 percent of all local taxes during fiscal year 1972/73, and for 22 percent in Seoul during 1971. The level, as well as the buoyancy, of revenue depends very much on how the tax is administered. In Jakarta and Seoul, where administration was good and rates were regularly adjusted to allow for changes in the price level, not only was the level of revenues generated substantial, but also the buoyancy was found to be high. In Jakarta it amounted to about 1.5 and in Seoul to 1.2 (Linn, Smith, and Wignjowijoto, 1976; Bahl and Wasylenko, 1976). In Bogotá, per capita revenues collected from the motor vehicle license taxes declined if allowance is made for inflation, thus implying a low buoyancy, whereas in Cartagena vehicle tax revenues expanded rapidly in recent years and exhibited a buoyancy probably somewhere in the neighborhood of unity (Linn, 1975). In Bombay and Ahmedabad, revenues collected from the local motor vehicle taxation remained approximately constant in real per capita terms and thus showed a buoyancy probably less than unity.[4] The main lesson from these widely divergent revenue experiences is that the capacity of the motor vehicle license tax as a major revenue source for urban governments depends very much on how it is structured and how aggressively it is administered. The rapid growth in the base will ensure a certain amount of revenue growth, but evasion and inflation are likely to cut heavily into this growth potential where administration is poor and specific tax rates are not increased to keep pace with changing prices.

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[4] In Bombay, the problem resulted mainly from the failure to keep current records on automobile ownership and to detect delinquent taxpayers on the road. Therefore, collections lagged well below 40 percent of total tax liabilities during the late 1960s. See Bahl, 1971.

The taxes discussed above might all be viewed as potentially important revenue-raising instruments. The efficiency impact of these taxes is uncertain, and for relatively low tax rates, probably not of much importance. This is less true for the more pure congestion charges: area- and time-specific vehicle licenses, parking charges, and tolls. All of these are suited for local government administration.

Singapore is one, perhaps the only, example of a large city making use of unrestricted motor vehicle licensing. The costs of introducing the scheme were minimal. To quote Watson and Holland (1978:37): "Overall, the total cost was less than it would have cost to build two kilometers of 4-lane urban expressway." The revenue implications of the scheme, while not of great scope, are on balance favorable. Annual revenues net of operating costs amount to approximately US $2.4 million. Compared with revenues collected from other taxes on motor vehicles or from property taxation, these revenues are not substantial (approximately 1 percent of property taxes), but in any case the system does not constitute a net drain on the public purse and compared with other tax measures has a low ratio of administrative costs to revenues.

Parking fees and taxes have been suggested as the major alternative to charging motor vehicle operators directly for the use of congested urban streets, but they are rarely used to any significant degree. The parking tax would have two major components: taxing commercial and private parking facilities in congested central city areas (e.g., as is done in Singapore) and levying fees for on-street parking either through attendants (as in Jakarta) or through parking meters (as in Central American cities). The study by Bahl and Linn showed no case where these taxes yielded significant revenues. Indeed, in one case (Cali), newly constructed parking facilities are given a ten-year exemption from all municipal taxes.

One is hard-pressed to find examples of LDC cities where *tolls* are used as a means to control congestion or raise significant amounts of revenue. To the extent that tolls are levied at all in urban areas they affect the more uncongested, special-purpose expressways, such as the expressway to the airport in San Jose, Costa Rica, where the main goal of the charge is presumably to recover the capital costs from the users. Indeed, the dilemma with toll roads is that they are always inefficient:

in uncongested traffic, because they restrict traffic below the optimal use of the road; and in congested traffic, because they tend to worsen, rather than alleviate, congestion and are furthermore costly to administer.

OTHER URBAN TAXES

Apart from property and automobile taxes, local governments can and do use a large number of other taxes and licenses. While these alternative sources of revenue are not always easily administered or free from unwanted efficiency or equity effects, and while they tend not to be the more comprehensive income and consumption bases that local governments would prefer, they have the advantage of being available. They also offer local governments the advantage of capturing some of the income and consumption growth that is characteristic of urbanization.

Local governments in developing countries typically have one major nonproperty tax revenue source, usually some form of indirect tax on local trade or business activity; some form of automotive taxation; and a large number of "smaller" local taxes. Often the latter are quite large in number but add relatively little to total revenues.

Income taxes

There is more use of local income taxation in developing countries than one might expect. Bahl and Linn have described the practice in India, the Republic of Korea, Zaire, Zambia, Nigeria, and Guatemala. Botswana employs a local income tax, but such a tax was abolished in Kenya in 1972. Local income taxes may not capture the benefits of urban growth as fully as one might expect, for three reasons.

First, the law usually does not permit a pure income tax, that is, one that covers nonwage incomes. More commonly, local governments must rely on some combination of a poll (head) tax, a wage tax, and limited income tax sharing with higher authorities. The poll tax element is important in Guatemala City, where a specific tax is levied on all men (and women in public-sector employment), distinguishing only between three income groups. In Zambia, a similar system applies, except that there are seven income groups taxed at different rates. In Zaire, local authorities are permitted to levy what amounts to a local wage tax at approximately proportional rates and a specific tax on traders and professionals, but only for those income earners who are exempt from the national income tax. The South Korean cities combine a head tax on heads of households (and on corporations) with a surtax on all tax liabilities of the national personal income tax, the corporate income tax, and the farmland tax. Nigerian cities, including Ibadan, have levied a local income tax on all taxpayers exempt from state income taxes, and the cities share in the state income tax. State law permits the local government in Calcutta to tax all professions, trades, and salaried persons. The point is that many of the fruits of urban growth are simply not included in the tax base.

Second, even where property and proprietorship income is taxable, the evidence shows that it is not taxed because of the difficulty of controlling evasion and underreporting. Presumably, this problem has moved at least the Zaire government to tax nonwage earnings at flat rates irrespective of the amount of income earned.

The third, and perhaps most important, limitation on the coverage of local income taxes in LDCs is simply the unwillingness of most central governments to give up any share of the income tax base.

To the extent that any generalizations are possible regarding this varied experience with local income taxes, one might conclude that all local income tax in LDCs can hope to achieve is to tax wage earnings in the modern sector of the urban economy.

There is little evidence on the actual revenue performance of local government income taxes in developing countries. From the study by Bahl and Linn, it may be observed that the performance of the poll tax variety of income tax has been dismal, while South Korea's broader-based levy has accounted for nearly one-tenth of total local government revenues.

General sales taxes

Few local governments in LDCs are permitted to levy broad-based sales taxes. Typically, this potentially important source of revenue is reserved for higher-level governments. Bahl and Linn's survey could turn up only Bogotá, Managua, and Rio de Janiero as deriving (at one time or another) significant amounts of revenue from broad-based local sales taxes. However, the sizable revenue yield in these three cities (69 percent of total tax revenues in Managua and 89 percent in Rio) attests to the considerable potential of local sales taxes.

Local taxes on industry, commerce, and professions

Taxes on industry, commerce, and professions are a common source of local government revenue. In many Latin American cities, this form of taxation contributes sizable proportions of total local tax revenue. For example, the local taxes on industry, commerce, and services (in the mid-1970s) accounted for 84 percent of local taxes in San Salvador, 67 percent in Valencia, and for as much as 73 percent in La Paz. In the Philippines, about 40 percent of locally raised revenues are from the local business tax.

The nature of this local tax varies widely among countries and even among cities within a country. In Colombia, for instance, five types of local taxes carry the title of "industry and commerce tax." A turnover tax is used in Bogotá, Medellín, Armenia, and Montería. A tax on the value of gross business assets is levied in Cali, Barranquilla, and Cartagena, among others. Some Colombian cities levy a tax on the value of fixed assets of the firm located in the taxing jurisdiction (e.g., Popayán, Neiva), others on the rental value of the business establishment (e.g., Cúcuta). Finally, most smaller municipalities in Colombia levy the tax in the form of specific levies by type of enterprise. Thus, while in all municipalities this tax carries the same name, it actually represents a sales tax in some cities, a tax on business capital in others, an annual value tax on business real estate in yet others, and in most small municipalities simply a business license tax.

The revenue yield potential of business taxes can be substantial. With urbanization, the number and size of business establishments increase and the taxable base grows. Even though the base may be inadequately assessed, the tax yield can grow rapidly. An analysis of the Philippine business license tax shows that even under quite poor assessment and collection practices, the income elasticity of the tax yield often has been greater than unity (Bahl and Miller, 1982: Chapter 3).

Octroi

In many cities in India and Pakistan, octroi is a dominant revenue source. The base of the octroi is the value, the weight, or the number of items entering a local jurisdiction by road, railway, sea, or air. Obviously the base will expand rapidly with local economic growth; hence despite its many flaws, the octroi is a productive revenue source.

In fact, in many Indian and Pakistani cities, octroi dominates the revenue structure, for example, in Ahmedabad, Karachi, and Gujranwala. In Karnataka State (India), it accounted in 1974 for 55 percent of tax revenues of all urban local authorities, as opposed to 33 percent for the property tax (Rao and Rao, 1977:26–27). Moreover, this importance appears to be increasing, since the octroi has also been one of the most buoyant sources of local revenue (e.g., in Ahmedabad, Bombay, Karachi, and Karnataka). This buoyancy is explained in part by the underlying automatic growth in the base as intercity trade expands in value and volume, but in part also it is due to the active efforts by local authorities to increase revenues by higher and restructured octroi tax rates. For example, Ahmedabad and Bombay carried out extensive rate structure reforms in the mid-1960s which have significantly increased the level and rate of increase of this tax (Bahl, 1971; Bahl and Wasylenko, 1976; Bougeon-Maassen, 1976). Finally, in Calcutta where the octroi was more recently adopted, it was introduced by the state government for the entire metropolitan area, with its revenues to be shared among the various local bodies and the Calcutta Metropolitan Development Authority.

Elsewhere, to the extent that they ever existed, taxes on intercity trade have become virtually extinct. For instance, in Iran a local tax equivalent to the octroi ("gate tax") was abolished in 1962 (Bahl and Linn, Chapter 6). In Cali, Colombia, a local statute prescribes a tax on all merchandise imported from abroad with the final destination of Cali. The rate is Col $0.02 (approximately 0.06 US cents) per kilogram. However, due to administrative difficulties and lack of effort in collection, this tax only contributed 0.6 percent of local government revenue in 1975.

Local sumptuary and entertainment taxes

If "bright lights" are a cause of rural-to-urban migration, they also offer some potential for urban government taxation. Taxes on beer, liquor, and tobacco–usually referred to as sumptuary taxes–are widely in use in LDCs, and in some countries local authorities are entitled to levy such taxes or to share in the proceeds of sumptuary taxes imposed by higher-level government. For example, in Zambian cities, the local tax on beer consumption is by far the most important source of local tax revenues; in Guatemala City, local taxes on liquor, beer, and cigarettes contributed 7.6 percent of local tax revenues (1971); in San Salvador, a local tax on liquor produced 15 percent of tax revenues (1973); in La Paz, a local beer tax contributed 7.1 percent (1975). In Bogotá, the national tax on beer consumption, of which 40 percent is shared on a derivation principle with departmental (state) governments and the city government of Bogotá, raised revenues that in 1972 amounted to 27 percent of all local government revenues (excluding local autonomous agencies) and was the largest single revenue source of the local authority (excluding all local autonomous agencies). The local government in Bogotá also derived revenues from a local tax on foreign cigarettes and a shared tax on all tobacco products.

In the long run, the income elasticity of sumptuary taxes is likely to be quite low unless real tax rates are continuously increased because of the low income elasticity of liquor and cigarette consumption. The Bogotá beer tax, which probably is one of the success stories in revenue performance, actually maintained its share in overall city government revenues in the ten-year period from 1963 to 1972. However, this was during a time when the most important other source of local revenue, the property tax, remained quite stagnant in real terms, thus depressing the overall growth of revenues in Bogotá.

It is common in many LDCs for local government, particularly in the larger cities, to levy taxes on various forms of entertainment. Among these are taxes on restaurants and hotels; on theaters, movies, and other types of public entertainment events; and on gambling. Revenues derived from lotteries operated by local governments also may be counted as an entertainment tax. Bahl and Linn's survey has shown that most cities in LDCs derive some revenues from entertainment taxes.

There are problems with respect to the revenue performance and administration of entertainment taxes. Assessment and collection can be difficult, as observed for instance in the case of Seoul or Jakarta. Revenues are generally not substantial, although their buoyancy can be considerable. For instance, entertainment tax revenues in Seoul and Jakarta had a buoyancy greater than unity, and in many of the other cities revenues from these taxes were among the most rapidly growing of all local taxes.

CONCLUSION

Three tax bases are particularly appropriate for financing urban growth in developing countries: real property, automobiles, and consumption. All tend to grow at least as rapidly as population or income and could, therefore, support the increased urban expenditures that support economic growth. In all cases, appropriate tax design could minimize allocative inefficiencies and set the stage for effective administration. For the property tax, this need not necessarily be at the expense of revenue. With respect to automobile taxation, there is clearly a revenue-allocation effect tradeoff.

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A false fertility transition: the case of American blacks

Paul Wright
and Peter Pirie

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PREFACE

This paper was begun when we were both at the East-West Population Institute, East-West Center, and the Department of Geography, University of Hawaii at Manoa. Since then Paul Wright has joined the Department of Earth Sciences at the University of California at Riverside. The East-West Population Institute has continued to support the work to completion. An earlier version of the paper was presented at the Annual Meeting of the Association of American Geographers, New York, in 1976.

Two anonymous reviewers gave us helpful advice, which improved the final product. We remain responsible for the advice we did not take and for the work as a whole. Sandra Ward edited the paper with skill and care, and we are grateful to her, to Lois Bender, who did the typesetting, and to Gregory Chu, who did the cartography. Alice Harris and her staff of the institute's Resource Materials Collection were consistently helpful.

ABSTRACT The decline in U.S. black fertility after the Civil War to its lowest level about the year 1936 does not fit the typical demographic transition pattern. Black life expectancy did not begin to increase perceptibly until the 1920s, and the economic and social environment of blacks, particularly those in the rural south, was unhelpful in lowering fertility.

This paper attributes much of the fertility decline to "involuntary infertility" related to sexually transmitted diseases, particularly gonorrhea and syphilis, and their sequelae, principally pelvic inflammatory disease leading to subfecundity and infertility, together with pregnancy wastage through involuntary abortion and stillbirth.

The cumulative increase in the incidence of venereal diseases among U.S. blacks is traced from the days of slavery through Emancipation to World Wars I and II. The possibility that blacks adopted contraception on a progressively large scale before the 1930s is examined and largely dismissed.

Circumstantial and historical evidence makes a compelling case for venereal diseases having a strong effect on U.S. black fertility, but it proved feasible to establish a stronger link between the two by using geographical techniques. Within the six-state region of the southeastern United States (South Carolina, Georgia, Florida, Mississippi, Alabama, and Louisiana) the incidence of syphilis among black males, as discovered by the Selective Service in 1940–41, is related to the areal pattern of black fertility by county in the same year. It proved possible to correlate the two variables at a fairly high level and to find explanations for the variations related to differential social and economic conditions within the region.

After World War II, U.S. black fertility rose dramatically. The rise was related to the prevalence of antibiotic treatment for venereal diseases, allowing many blacks to realize a long-thwarted desire for larger families. A slight increase in fertility had occurred after about 1936, which was related to improved general health, the use of sulpha drugs, and more vigorous action by federal and state authorities against venereal disease. The pattern of fertility in 1960 showed substantial increases in virtually all counties in the six-state region and more particularly in those where fertility had been most depressed. Using several methods, we estimate the physiological impact of the venereal disease-related infertility as having accounted for about 56 percent of the total fertility decline before 1936. The remaining 44 percent would be distributed among such causes as inadequate statistical data, which we see as weakening our case; other pathologies, such as tuberculosis, pellagra, and malaria; and deliberate family limitation, concentrated first among the northern urban blacks, but having a progressively greater effect on all blacks during the period.

After 1957, by which year black fertility was at a level not achieved since 1910, fertility again began to decline. This decline we see as largely

deliberate, owing to the increasing adoption of family planning methods and the initiation of the final phase of blacks' true demographic transition. The effects of the prevalence of venereal disease are now difficult to gauge, but it must have blighted hundreds of thousands of black families. Instead of 26 million, the number of blacks recorded by the U.S. census in 1980, the black population, without the "involuntary infertility effect," would probably have been at least 45 million. Although the magnitude of the problem has been greatly reduced, it has still not evaporated: nearly one million cases of pelvic inflamatory diseases still occur every year, the venereal diseases are having a troubling resurgence, and blacks in the southeastern states are still disproportionately affected.

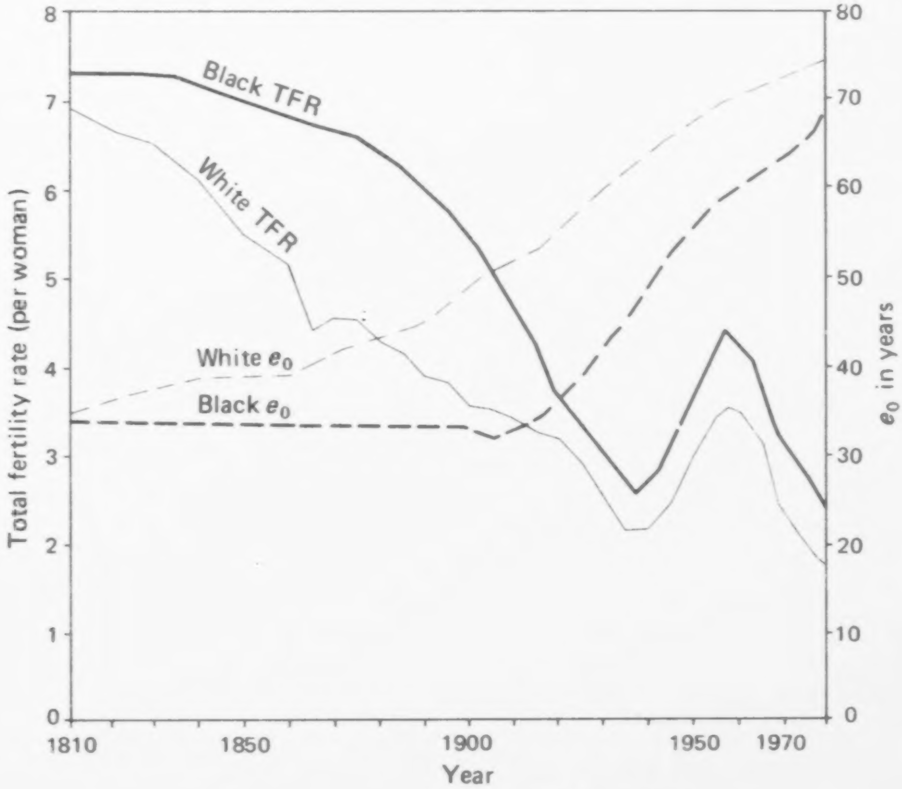
A sustained fertility decline among the black population of the United States, beginning after the Civil War and ending about 1936, is now well established (e.g., Eblen, 1974; Coale and Rives, 1973). During the late 1930s, this trend was reversed and black fertility reached a peak in 1957 of over 60 percent above the 1936 low. By 1960, another decline, which is still continuing, had become apparent (Figure 1).

The trend in black mortality, expressed in Figure 1 as expectation of life at birth (e_0), is not so well established; but it appears to have remained at a relatively constant level (about 30–34 years) until after World War I, when some improvement became apparent. Recent levels (1981) are close to 70 years, still about four years below that for the white population. For the black population mortality remained virtually unaffected by improvements in medical care or environmental sanitation for over a century after the white population had begun to benefit significantly from modern health development. From a level similar to that of the black population around 1810, the white population achieved an expectation of life of about 40 years in 1865 and about 52 years in 1910. Another implication of the curve showing expectation of life for blacks is that, before it achieved any significant upward movement, over half of the total decline in black fertility, as shown by a drop in the total fertility rate (TFR) from about 7.0 per woman prior to 1865 to about 4.75 in 1910, had already been accomplished.

BLACK FERTILITY TRANSITION: DELIBERATE OR INVOLUNTARY?

These characteristics, at odds with the traditional demographic transition model, are both unexpected and unusual. According to

FIGURE 1. Trends in total fertility rates (TFRs) and expectation of life at birth (e_0) for the white and black populations of the United States, 1810–1979



SOURCES: Eblen (1974); Coale and Rives (1973); Demeny and Gingrich (1967); Coale and Zelnick (1963); U.S. Bureau of the Census (1982).

transition theory, declines in fertility should postdate, usually by several decades, the initiation of mortality decline. The mystery is deepened further by the absence of any discernible parallel improvement for most blacks in conditions usually associated with voluntary fertility limitation. Instead, in the two decades between 1937 and 1957, during which black fertility rose dramatically, their living standards began to benefit from rapidly improving economic conditions related to the New Deal and World War II, together with the mounting assertion of black civil rights and the rising conscience of white Americans.

A complicating factor in the interpretation of the causes of this fertility trend among U.S. blacks is the relationship the trend shows with that of the white population. Although consistently higher, the black TFR declined in tandem with the white after 1870 and since 1915 has generally tracked within less than 1.0 difference with almost uncanny precision. The temptation to assume that the two populations are responding to the same set of causes is great. "[Data] . . . suggest the demographic transition as a national process affecting both the majority population of largely European origin and the minority of largely African origin, though with difference in timing" (I. Taeuber and C. Taeuber, 1971: 379). Somewhat more cautiously, Coale and Rives (1973: 30–31) have stated:

> A puzzling feature of the time pattern of black fertility is the beginning of a very steep and sustained decline as early as 1880. The black population in the United States remained almost entirely Southern and rural until 1900. To a high degree it was substantially less urban than the white population in 1930. . . . Moreover our estimates show little change in mortality between 1880 and 1900. . . . In short the black population in the U.S. does not appear to be a population that was ready for demographic transition beginning in the 1880's. One interpretation of the decline is that it represents a diffusion of attitudes and practices from the white population in which the decline in fertility had begun much earlier and had proceeded far by 1880.

It was to test this process, using a diffusion model on fertility changes, that our study was initiated.[1] We began by mapping the child-woman ratios (CWR) by county in six southeastern states: Alabama, Florida, Georgia, Louisiana, Mississippi, and South Carolina. The geographical pattern of implied fertility shown by the census data for 1930 and 1940 was not one that could have been expected on the basis of the demographic transition.

By 1960, fertility levels, although much higher overall than in the earlier censuses, did vary areally in a more traditionally explicable pattern. These spatial patterns for 1930, 1940, and 1960 are shown and discussed in detail later in the text.

The peculiarities of the 1930 and 1940 fertility distributions, particularly the occurrence of extremely low fertility among blacks in many of the least developed and most poverty-stricken counties, led us to invoke another model, that involving progressive involuntary subfecundity related to disease, as a major factor in the decline.

---

[1] As the model is not pertinent to the study as it evolved, we do not discuss it in this paper. Interested readers are referred to Demko and Casetti (1970).

The possibility of disease-induced subfecundity in relation to the U.S. black population has been raised before, notably by Reynolds Farley in his work *Growth of the Black Population* (1970: 222–35). Farley concludes:

> As far as we can detect, this decrease [in black fertility] was chiefly brought about, not by changes in marital patterns or the increased use of contraceptives, but by alterations in health conditions which were unfavorable to fecundity (p. 243).

Farley examined the role of venereal diseases and pellagra in some detail before coming to this conclusion. In this paper we focus on the contribution of sexually transmitted disease (STD) to this situation, without necessarily discounting the possibility that other medical problems, an increasing use of birth control, changes in marital stability, mate exposure, and family structure also contributed to the decline.

The sexually transmitted diseases involved are principally syphilis and gonorrhea. The role of gonorrhea in causing pelvic inflammatory disease (PID) has been well established; but other microorganisms, notably *chlamydia trachomatis* and *mycoplasma hominis*, have also been implicated (St. John and Brown, 1980). In the literature of the day, between the 1880s and the late 1930s, only syphilis and gonorrhea are identified as widespread venereal diseases among blacks. Chancroid, which does not appear to affect fecundity, was also referred to occasionally. Salpingitis, inflammation of the fallopian tubes, is attributed to gonorrhea in virtually all cases. The possibility of other agents such as chlamydial infections or other known causes such as induced abortion, various gynecological procedures, and of course IUD insertion, is not raised. Nor did we find the suggestion in this literature of the probability that one of the consequences of salpingitis is increased risk of ectopic pregnancy, now known to be a factor in fetal wastage. It seems that several of these factors have increased in their frequency in recent decades or have only lately been recognized (Westrom, 1980). Since none of these agents could be successfully treated during the period in which most of the fertility decline occurred, it is not of great importance if agents other than gonorrhea are involved in salpingitis if they too are sexually transmitted. The outcomes, subfecundity and increased sterility, are the same and their incidence is likely to be correlated.

Historical precedents

An accumulating body of evidence suggests that, historically, venereal diseases have been effective in depressing fertility in several populations. In a variety of documented instances, low fertility, slow population growth, or even depopulation has been associated with a prevalence of venereal diseases throughout an entire society. One of the earliest and most detailed of these cases, studied by a medically qualified investigator, occurred in the New Ireland district of New Guinea (Scragg, 1954). Studies by Underwood (1973) and Lessa and Myers (1962), dealing with specific cases in the Pacific Islands of Yap and Ulithi, respectively, support a similar conclusion. Pirie (1972) reviewed evidence of the effects of gonorrhea and syphilis on fertility in the Pacific Islands, discussing the possible effects also in Hawaii, the Marquesas, the Society Islands, several Micronesian islands, and among the New Zealand Maori.

In Southeast Asia, the case of the Muruts in Borneo described by Clark (1951) and Polunin (1958) implicates gonorrhea. Populations showing low fertility are found in several places in tropical Africa. Researchers studying these populations have identified gonorrhea and in some cases syphilis as major agents. Griffith (1963) noted a high correlation between fertility variation and reported rates of gonorrhea in different areas of Uganda, for instance. Arya, Nsanzumuhire, and Taber (1973) came to similar conclusions in an examination of two Ugandan districts of contrasting fertility. The low-fertility group showed a high incidence of PID and gonorrhea, whereas much less was observed in the district with high fertility. Romaniuk (1968a) investigated low fertility and infertility in Zaire and cited both gonorrhea and syphilis as probable causes. In another paper, he reviewed several cases derived from the literature on the relation between incidence of venereal diseases and low fertility in African societies (Romaniuk, 1968b: 214–24). Several papers given at the Symposium on Pelvic Inflammatory Disease held in Atlanta in 1980 provide additional evidence of such a relationship (e.g., Arya, Taber, and Nsanze, 1980; Muir and Belsey, 1980; Ratnam, Din, and Chatterjee, 1980; and Perine et al., 1980). The number and variety of these cases suggests that when populations with prevalent but apparently involuntary infecundity and childlessness are observed we should be alert to the possibility of a causal relationship with venereal disease.

Conservative interpretations

The possibility of venereal disease being a major cause of low fertility has not been readily accepted by all researchers. Joseph A. McFalls, for instance, after reviewing Farley's work, offered "a more conservative interpretation" of the importance of the effect of venereal disease on black fertility, and after assessing the possibilities as he saw them came to the conclusion:

> The black fertility trend was probably fashioned by essentially the same traditional factors that determine its white counterpart. . . . It is difficult to support the hypothesis that the explanation of the black fertility trend is unique or radically different from that of the white counterpart (McFalls, 1973: 18).

More recently, Stanley L. Engerman (1978), an historian associated with the controversial work *Time on the Cross: The Economics of American Negro Slavery* (Fogel and Engerman, 1974), reviewed the decline in black fertility over the period 1880–1940. He suggested that such writers as Farley neglected socioeconomic factors in explaining the decline, and described the quantitative effect of venereal diseases on fertility, in his only reference to the matter, as "dubious" (p. 103). He concluded on an uncertain note:

> It is possible that factors relating to slavery did delay onset of the transition and can explain the lag of the U.S. black population behind the white in marked declines of fertility. To study that we need to know more about the determinants of fertility in the slave period, ... [W]hile the situation of American blacks in the years between 1880 and 1940 was in many ways clearly different from that of other groups, it seems that in the cross-sectional differences, as well as the movements over time, much of the black fertility pattern resembles that of the whites of the United States and elsewhere, as well as that of the free black populations in other parts of the Americas (Engerman, 1978: 153).

THE INVOLUNTARY SUBFECUNDITY HYPOTHESIS

We believe it is now possible to be considerably more definite about the causes of fertility decline among blacks after Emancipation, which we see as premature, largely involuntary, and propelled by forces very different from those affecting the proximate but virtually separate white population. We shall examine the fertility trends of blacks and gauge the degree to which the movement and timing of those trends is better explained by the involuntary subfecundity hypothesis than by the demographic transition theory. The potential effects of sexually transmitted disease on fertility will be discussed and the trends in the incidence of fertility-inhibiting diseases among U.S. blacks assessed.

We use a model to test the relationship between black fertility in 1940 and the contemporaneous incidence of syphilis as indicated by the U.S. Selective Service data for the counties of the six selected states. Those states have the highest proportion of blacks in the general population, and for almost all counties in them the results of serologic tests for syphilis performed on military draftees, vital statistics, and census data on blacks are available or can be estimated. With the partial exception of Florida, those states also contained the poorest blacks and the highest proportion of blacks engaged in agriculture. If the involuntary subfecundity hypothesis is valid, it should have its greatest explanatory power in this region.

Some cautionary explanations are necessary at this stage. This paper is by no means the complete and unassailable statement we should have liked to make. Data on venereal diseases are notoriously elusive; and historical records, particularly those relating to the 1930s or before, are full of traps, omissions, confusions, and, in the light of hindsight, obvious misinformation. Even our most comprehensive data—those on U.S. blacks by county collected in successive U.S. censuses—are known to be faulty and to have been subjected to "corrective adjustment." The registration of births to blacks in the six states was usually deficient. Data relating to the physical examinations of recruits in World War II by the Selective Service Boards, as they refer to venereal syphilis, are incomplete. For the rest, we rely on small-scale studies that in most cases had intentions very different from our own. Although these data generally support our thesis, we believe that had they been better, the support would have been more positive.

Venereal disease and fertility

It is rare to find concise information about gonorrhea and venereal syphilis as they affect fertility. One source of confusion is the tendency of writers to lump the two together as "VD" (venereal disease). Although it is true that "their mode of transmission, modern treatment and prevention differ only in detail" and that "both diseases flourish under the same combinations of demographic and socioeconomic conditions," it is not true that "syphilis and gonorrhea are quite similar" (McFalls, 1973: 8). Their periodicity, symptoms, sequelae, and effects on the process of childbearing are very different. When examining them for their demographic effects, it is therefore preferable to treat them separately.

Characteristics of gonorrhea

The best-documented effect of a venereal disease on fertility is that of gonorrhea. In societies where sexual mores dictate or tolerate frequent intercourse involving a variety of partners for at least a segment of the population, particularly if this segment is the young, the setting is ripe for a high incidence of gonorrhea. The only other necessary condition is a readily available reservoir of infection. In the case of U.S. blacks, this resource was originally supplied by the U.S. whites. Under such conditions, if gonorrhea is not rampant, the question to ask is "Why not?" Possible answers could be that the disease has not been introduced (as in precontact Tahiti) or that the population is educated to seek prompt and effective treatment with antibiotics (as is largely true in many modern Western countries). In the situation described–a situation that existed among a substantial proportion of the U.S. black population after Emancipation and before the development of antibiotic-based health programs–gonorrhea will work insidiously but effectively to lower fertility.

Among women, about 15 percent of all cases of gonorrhea will result in pelvic inflammatory disease (PID). In the literature we have been using, the condition is usually described as salpingitis. The fallopian tubes become obstructed by scar tissue caused by inflammation. This condition reduces the chance of conception and renders the victim completely sterile in about 20 to 30 percent of all cases (Wilcox, 1964: 679). Among blacks during the period under review, the damage must be considered irreversible. Whereas female gonorrhea is frequently asymptomatic, salpingitis is usually, but not always, noted and remembered as painful.

Among males, untreated infection may cause epididymitis, which occurs in about 20 percent of all cases. Of these, about one-third results in complete sterility (Pelouze, 1939: 240).

The short incubation period of gonorrhea, about three days, permits its rapid spread, and one attack provides no immunity from a subsequent infection. The disease recedes spontaneously, and victims remain infectious for only a few months and certainly less than one year unless complications are severe.

Characteristics of venereal syphilis

The symptoms of syphilis, initially skin lesions and, later, involvement of the central nervous system, leading to physical deterioration, insanity, and, in many cases, death some decades after the initial infection, are much more dramatic and destructive than those of gonorrhea. As a result, syphilis received far more medical and societal attention than gonorrhea in the preantibiotic past. We are primarily concerned, however, with its impact on fertility.

Several studies have tested the effect of venereal syphilis on fecundity (e.g., H. Solomon and M. Solomon, 1920; Parker, 1929; Fellows and Perry, 1941; and Stix, 1941b). Conventional medical wisdom has it that syphilis itself does not inhibit the ability of a woman to conceive nor of a man to impregnate her. It is well established, however, that a syphilitic mother, particularly in the early stages of the disease (usually within two years of contracting it), is likely to transmit it through the placenta to the unborn child. The results frequently include spontaneous abortion, miscarriage, and stillbirth. Many infants successfully carried to term are congenital syphilitics having varying degrees of damage, which may preclude their survival or lower their resistance to other risks of mortality.

For our purposes the best study is that by Stix (1941b), who compared two groups of black women in the South (Spartanburg County, South Carolina). One group showed positive reactions to a test for syphilis or had a history of previously diagnosed syphilis; the other showed no evidence of syphilis. Excluded from both groups were women who practiced contraception, had a history of gonorrhea or were currently infected, or were found to have any pathology that might have inhibited their fertility. Stix estimated the effective fertility–that is, live births–to be 23 percent lower among women with syphilis than among the "nonpathologic" group (p. 299). This appears to be the best estimate available.

The relative incidence of the venereal diseases

The method of gonorrhea and syphilis discovery under mass survey conditions, such as those conducted by the U.S. Selective Service Boards, requires some explanation. In most cases, tests show positive reactions to antibodies, indicating venereal syphilis. Antibodies develop shortly after the disease has been contracted, and positive reactions to them persist unless successful treatment is completed or, failing this, voluntary remission occurs. Voluntary remission happens in about one-fifth of male and two-fifths of female untreated cases after 15 or more years of infection. The commonly noted increase in syphilis occurrence up to about age 40, and a decline in the rates at later ages, reflect this pattern of remission. Reinfections are possible but can occur only when the development of antibody reaction is aborted, for instance after early and completely successful treatment.

Gonorrhea cases, by contrast, are likely to be recorded only during the short period of infection (and often not even then, as diagnosis is not a simple matter) or when recollected as a past event by patients, more commonly by men than by women. The detailed examination of damaged organs leading to the discovery of fertility-inhibiting sequelae may indicate other past infections.

Most cross-sectional surveys, therefore, underestimate the prevalence of gonorrhea. The chances of any one syphilis infection being observed in a cross-sectional screening system are much greater than that of any one gonorrhea infection, making suspect the common clinical opinion that gonorrhea is always about four times more prevalent than syphilis.

Information gained from data on new cases reported gives a better indication of the relative incidence of the two diseases, but even with these data there are problems. Only in regimented populations are the data reasonably complete. Military records are probably the best available. Those of the U.S. Navy, as kept from 1914 to 1940, show a consistent ratio of 3.6 new gonorrhea cases to every one new syphilis case (Stephenson, 1940: 407). Disaggregation of the data may reveal different situations. For instance, U.S. Navy data for 1923, while showing that reported gonorrhea cases outnumbered those of syphilis by 4.2 to 1, also showed that the ratio was highest among the 16–19 age group (8.3:1) and the 20–24 group (5.0:1). It decreased thereafter, to 1.0:1 for the 45–49 age group. In commenting upon these data, the Surgeon General stated that it was likely that old cases of syphilis were being discovered among the older age groups and that gonorrhea was more likely than syphilis to go unreported (Surgeon General, U.S. Navy, 1925: 156). By 1940, U.S. Navy authorities were reporting a gonorrhea/syphilis ratio of 7.4:1 (Stephenson, 1940: 407).

The hypothesis that U.S. black fertility was significantly reduced by venereal diseases does not necessarily imply that most, or even the majority, of blacks were actually infected. What is suggested is that a relatively large proportion contracted the disease early in their sexually active lives and, in the case of gonorrhea, suffered repeated subsequent infections. Throughout this period there was always a proportion of the black population characterized by stable marriage, loyalty to one mate, and fertility that was limited, if at all, by voluntary methods.

Evidence is elusive, but two studies suggest the relative incidence of gonorrhea and syphilis and point up the possibility of repeated attacks of gonorrhea.

In a confidential survey of black males, conducted in several industrial cities of a southern state in the early 1920s, respondents were told about the symptoms of gonorrhea and syphilis and asked to list their experiences with both diseases. Of the 888 replies, 8 percent indicated an experience with syphilis. An additional 4 percent of respondents admitted to having had a "sore" near their genitals, which in most cases, the study report suggests, would also have been syphilitic. The survey findings indicate an incidence of syphilis of between 80 and 120 per thousand in this group. Gonorrhea was reported by 54 percent of respondents, and among them the average number of instances was 1.7, resulting in a total incidence of 815 per thousand persons. The average age of those admitting to venereal diseases was 25 years, so that the probability of reinfections, in the case of gonorrhea, must have been quite high (Anonymous, 1924).

In the second study, 412 male patients, of whom 406 were blacks, were interviewed at a Delaware syphilis clinic in 1943. Of the total, 374, or 91 percent, also admitted to past histories of gonorrhea or were found to be currently infected. The average age at the time of the first attack was 19 years. Those who gave past histories of gonorrhea indicated a total of 787 attacks, an average of 2.1 per person (Cameron and Chapman, 1944: 239).

These studies do not indicate with certainty the prevalence of the hypothesized situation, and the populations questioned were not necessarily typical, but they are suggestive of the situation we believe to have been common.

The effect of venereal disease on fertility characteristics

In populations stricken with high levels of venereal disease, fertility patterns acquire distinctive characteristics that in turn may become symptomatic of the disease. Two of these are age-specific fertility rates of unusual form and, among women, high levels of childlessness. The typical pattern for age-specific fertility rates in these cases is of high levels in the first quinquennium of the reproductive age range and a noticeable decline thereafter. This pattern, in contrast with the more usual type, which peaks in the 20–24-year age group or even later, reflects sexual behavior patterns characterized by early initiation, high levels of activity and partner change, and little or no attempt at contraception, resulting in initially high fertility. Subsequently the proportion of potential parents affected by venereal diseases and fecundity-inhibiting sequelae increases, and fertility progressively declines. The contribution of syphilis to this sequence is much less than that of gonorrhea; but to the extent that most cases are acquired at young age–that is, in the late teens and early twenties–and the effect is greatest soon after infection, a high incidence of syphilis will reinforce the gonorrhea-induced pattern to some extent.

To illustrate the contrast between a population markedly affected by fertility-inhibiting disease and one not discernibly affected, we show in Table 1 two populations, the first a black rural population

TABLE 1. Age-specific fertility rates for two populations

Age group	A U.S. black population in rural Mississippi Delta area, 1939–40 (a)	Malay population in Malaya, 1957 (b)	Ratio (a):(b)
15–19	166.3	162.6	102:100
20–24	163.9	341.9	48:100
25–29	124.4	279.3	45:100
30–34	86.3	207.9	42:100
35–39	57.0	146.3	39:100
40–44	16.6	55.3	30:100
45–49	3.3	16.3	20:100
Total fertility rate	3.089	6.048	51:100

SOURCES: Vandiver (1950: 78–84); Fell (1960: 42).

observed in the Mississippi Delta area that had high rates of venereal disease, and the second the ethnic Malay component from the 1957 Census of Malaya. We chose the latter as being typical of a rural, peasant, pronatalist society with a level of fertility for the 15–19-year age group that is similar to that of the black example. Malay fertility was then little affected by either venereal diseases or family limitation. The two patterns diverge markedly. The contrast deepens with age, but the greatest differences develop early. In the 20–24 age group fertility among the Delta blacks was less than half that of the Malays. For this black population fertility was not, in fact, very low. The TFR of 3 is above replacement level even allowing for high infant mortality.

The other diagnostic trait giving a strong presumption of the gonorrhea effect is a high proportion of childlessness. In any given population some women will be physiologically incapable of bearing children and an additional group will for various reasons choose not to. Among U.S. blacks before 1960, particularly in the rural South, we can find little in the literature to indicate that disinclination played more than a minor role. We interpret the rising fertility between the late 1930s and the late 1950s as strong evidence of a previously thwarted desire for more children by many black families. The timing of this increase has parallels in several other populations. For instance, in the Pacific islands it is seen as associated with improved public health and, particularly after World War II, with the widespread use of the antibiotics (Pirie, 1972: 199).

The proportion of women who are barren in populations relatively free of fertility-depressing diseases, but in which marriage is virtually universal, usually does not exceed 5–7 percent of the whole. Where there is little or no evidence of voluntary causes, involuntary mechanisms, principally related to the effects of venereal disease, must be suspected. The 1835–39 cohort of ever married black women (those whose reproductive lives spanned the years 1850–80) reported 5.6 percent childlessness. This is a normal level, which leaves little room for voluntary childlessness. It supports the common observation that black social norms of this time encouraged childbearing and large families, since this group reported an average total of 6.9 children. In contrast, ever married women born to the 1905–09 cohort, whose reproductive span covered the 1920–50 period, reported 28.4 percent childlessness and 2.7 children as the mean completed family size (I. Taeuber and C. Taeuber, 1971: 378). An indication that social attitudes had not veered away from large families completely lies in the finding that, of this cohort, 13 percent achieved completed families of seven or more children. But the implication here is that a large segment of the black population was no longer characterized by "traditional" fertility.

Family limitation among blacks prior to World War II

One of the problems faced by those who see the earlier decline of fertility among blacks as being largely deliberate or voluntary–that is, as a movement parallel to the contemporary white trend–is to explain the means by which blacks were able to achieve such low fertility levels within an unhelpful demographic and social environment. The widespread use of birth control is the most obvious possibility, and this hypothesis has been addressed in a recent paper (McFalls and Masnick, 1981).

While admitting that "little is actually known about the use of birth control among blacks from 1880 to 1940," a view with which we hasten to agree, McFalls and Masnick remind us that all societies know of, and practice, some forms of fertility limitation (McFalls and Masnick, 1981: 92). Induced abortion and some forms of contraception, notably male withdrawal (and presumably also prolonged breast-feeding), were known and practiced both in tribal Africa and among the American slave population, although at what scale and to what effect cannot now be known. McFalls and Masnick disagree with the view that few blacks used birth control during the 1880–1940 fertility decline. They also question the notions that black contraceptors failed to affect their fertility levels significantly because they used inefficient methods (e.g., douche and male withdrawal), did not use their chosen methods efficiently, or adopted family planning so late in their reproductive careers that it could have little demographic effect. The evidence assembled in their paper to support their position can only be described as slender, but their opinion is difficult to contradict for the same reason–solid evidence on this matter is deficient.

More objection may be registered to their dismissal of the first survey attempts, made in the 1930s, to measure the prevalence of birth control among blacks (McFalls and Masnick, 1981: 99). The most ambitious of these was by Raymond Pearl in 1931–32 (Pearl, 1936a and 1936b). Of a total of nearly 31,000 reproductive case histories collected by attending doctors at confinement from women who gave birth in cooperating urban hospitals in large cities of the northeastern states, 5,633 were from blacks. The sample, although large, was overrepresentative of certain types of women, i.e., fertile, married, northern-dwelling urban, and prone to have children in a hospital (which at this time only about a third of all mothers did). The sample women also tended to be better educated than average. These characteristics in general seem likely to predispose the sample to be more aware of the possibilities of family planning and perhaps more frank in discussing it. The circumstances under which the information was collected would seem to have been exceptionally favorable for the gathering of gynecological information, given the recent shared experience of the respondents and questioners. Pearl believed the data relating to black females to be of substantial accuracy (Pearl, 1936b: 272).

Pearl reported that 16.4 percent of the black women interviewed admitted to having used some contraceptive technique to prevent pregnancy. This proportion compares with 43 percent of white women in the sample. The black women declaring that they had done nothing to limit their fertility comprised 83 percent. The statements of the remainder, 0.6 percent, were disbelieved for some reason. To determine how effectively the women used the techniques they claimed, two groups were identified, the first consisting of women married once only and living with their husbands, who had never used birth control and had no detectable gynecological disability, the second comprising those in the same situation, but who had practiced contraception "regularly and steadily without intermission . . ." throughout their marriages (Pearl, 1936a: 505). Among the black women the differences in fertility between those who practiced birth limitation and those who did not were not measurable. Pearl concluded that "the general run of Negroes do not practice contraception effectively" (Pearl, 1936a: 505). Pearl's sample was not from "the general run of Negroes," who were much more southern and rural than his group. But had such a survey been taken of a truly representative group, it is likely that their problems with infecundity would have been greater and their propensity to contracept even less.

Another study, involving a maternal health clinic in Spartanburg County, South Carolina, although based on a much smaller sample than Pearl's study, is of particular interest because it involved both rural and urban blacks from a cotton-growing county within the six-state region we are considering (Stix, 1941a and 1941b). The purpose of the study was to compare the effectiveness of the services of three maternal health clinics, of which Spartanburg was one. The others, in New York City and Cincinnati, served white communities. Nearly half of the Spartanburg clinic's clientele were blacks (457 compared with 530 whites), and the data for them were tabulated separately. Stix presented the data applying to black fertility and family planning incidentally rather than as the main topic of her paper.

The Spartanburg patients, both white and black, were generally of low economic and educational status. They tended to marry early (at age 18.2 on average for blacks) but to have low fertility relative to the period at risk of pregnancy. Stix related this finding directly to the prevalence, among both whites and blacks, but more particularly the latter, of "pelvic or endocrine pathology or pellagra or syphilis" (Stix, 1941a: 179). Of the Spartanburg black patients, 31 percent tested out as having syphilis. The effect of the disease was seen in 16 percent of their pregnancies being terminated by spontaneous abortions or stillbirths. In contrast to the whites at all three clinics, the blacks had a negligible incidence of induced (illegal) abortion, only four cases being noted in the study.

The results of the survey applicable here were:

- Only 15 percent of the blacks attending the Spartanburg Clinic had previously attempted contraception. By contrast the proportion for whites was 38 percent. In the New York and Cincinnati clinics the white proportions were 90 percent and 73 percent respectively.
- When black women used the prescribed contraceptive (almost always a diaphragm and spermicidal jelly), as instructed by the clinic, the proportion of pregnancies avoided was 80 percent, a proportion virtually identical to that of the white women of Spartanburg and also to the "welfare recipient group" at the Cincinnati clinic. This proportion would have been much higher for both Spartanburg groups had they been more dextrous in the use of the method in the first three months, when the level of accidental pregnancy was over ten times as high as it became later.
- The most frequent reasons given for abandoning the prescribed contraceptive among blacks was that it was "too much trouble to use," whereas among the white patients the most frequently cited reason was discomfort. Blacks also recorded "difficulty in placement" much more frequently than whites.

- After visiting the clinic, blacks had the highest levels of continuing to use no contraception at all (11.7 percent) and discontinuing contraception after using the clinically prescribed device (27.2 percent).
- After attending the Spartanburg clinic, black women whose preclinic contraceptive practice had had little effect on their fertility showed a dramatic increase in the effectiveness of their contraceptive practices (179 percent overall). Even if the prescribed contraception is discounted, their effectiveness nearly doubled.
- When black couples abandoned the contraception technique prescribed by the clinic, they showed an overwhelming preference for a return to the douche. As used by these women, this method averted about 60 percent of the pregnancies that would have occurred had no contraception been used. The condom, which was a popular alternative to the clinically prescribed method among whites attending the clinics, was not favored by blacks, who usually cited cost as the discouraging reason.

Overall, one does not get an impression from the Stix study of a black population previously accustomed to or at ease with family planning techniques.

The third study, by Beebe ~~in~~ 1939, involved 155 black women (along with 380 whites) who were married to coal miners in Logan County, West Virginia (Beebe, 1941). The survey involved a much smaller and more restricted sample than the other two and the area studied is outside the six-state region. It is nevertheless of some interest, as the purpose of the report was "to demonstrate the irrelevance of contraception" in explaining why the fertility of white women exceeded that of the black women by more than 50 percent (p. 190).

Only 7 percent of the black women reported any contraceptive practice, compared with 33 percent of the whites. These black users, although small in number, had much higher fertility than those not practicing birth control. Black women who did not practice birth control because they wished to become pregnant had the lowest observed fertility of any group (p. 193). Beebe concluded that although many of the blacks surveyed were childless, not all of the low fertility for blacks as a group could be explained by this factor. Contraception played an insignificant part; and this left only two other possibilities, impaired fecundity and pregnancy wastage—i.e., abortion or stillbirth. Beebe noted that, among the women who accepted family planning, "voluntary pregnancy wastage" did not contribute significantly to their low fertility. He therefore implied that involuntary sterility, which is often gonorrhea-related, and involuntary abortion or stillbirth, often syphilis-related, were the major factors (p. 195).

It has been necessary to review these surveys in some detail, both in their organizational setting and in the results yielded, because of their collective dismissal as "virtually worthless" in the recent study by McFalls and Masnick (1981: 99). McFalls and Masnick assert (p. 99): "Early studies of birth control use among blacks grossly underestimated its prevalence for a variety of reasons, the most important of which was the reluctance and refusal of blacks to admit to the practices."

They cite various reasons for this reluctance. One is that blacks in the 1930s thought that discussion of contraception was too coarse for polite conversation in American society of their day. This reason would seem to be irrelevant to the studies discussed here, since the black women interviewed were talking under survey conditions to doctors or clinical personnel rather than making polite conversation. Another is that blacks felt constrained because contraception was frequently restricted or "outlawed" in the United States. A third is that blacks would refuse to cooperate with white interviewers because of bad race relations. McFalls and Masnick also suggest that some blacks were practicing birth control without their spouses' knowledge and would not have wanted to admit this, and that others were practicing birth control in ways they did not recognize as such (abstinence, douching, or male withdrawal). Having cited all these reasons, they comment, "Indeed, one wonders that any blacks admitted it at all!" (p. 96). That many black women did tell of their contraceptive practices, even under these conditions, suggests that the constraints were not perhaps as powerful as McFalls and Masnick suggest. Had contraception been as common as they contend, it would have been so widely acknowledged that for black women who used it prevarication would have served no purpose.

In their presentation of contrary evidence, McFalls and Masnick rely on two surveys. The first, reported in 1976 but conducted in 1966–68, was by Immerwahr, who interviewed in Baltimore 50 lower-middle-class black women in their fifties and sixties, an unspecified number of black males, and "several black sociologists" (Immerwahr, 1976: 6). The other, which they recently conducted themselves in

Philadelphia, included among its subjects 279 black women in the 55–59 age group–that is, those whose childbearing began in the low-fertility period of the 1930s Depression (McFalls and Masnick, 1981).

Both these surveys had small numbers of informants, who were northern and urban. The studies focused on the last decade of the fertility decline and, worse, were retrospective. Were we forced to choose between the two groups of surveys on the basis of which provided the most reliable information on the prevalence of contraception among all blacks from Emancipation to World War II, we would have to select the three done in the 1930s, despite their deficiencies. To coax women in the contracepting society of the 1970s to recall their birth control practices four decades before seems to be inviting misinformation.

The surveys of the 1930s did find that blacks knew of, approved of, and practiced family planning, but to an extent that varied considerably by location and class. Blacks outside the South, nearly 90 percent of whom were urban-dwelling in the 1930s, appear to have practiced conscious family planning on an appreciable scale. Pearl (1937: 1387), surveying black women in Chicago, found that 47 percent overcame their scruples and admitted using contraception. Among urban blacks outside the South, it has been established that fertility levels were low and changed only slightly during the 1900–40 period (Farley, 1970: 105). In the 1930s, however, 80 percent of blacks still lived in the South and there remained predominantly rural and poor. Among them, contraceptive use appears to have been negligible. The evidence for this inference is admittedly not strong, but in the absence of positive evidence related to innovation of this kind, it is reasonable to assume that the diffusion of family planning was still in its early stages.

A study by Tolnay (1981), which contrasted urban and rural black fertility in the closing years of the 19th century (1886–99), using data derived from the 1900 census, found that the age pattern of urban black marital fertility strongly indicated deliberate family limitation, perhaps as early as 1880 but certainly before the end of the century. By the 1893–99 period the total marital fertility rate (TMFR) of urban blacks was down to 3.5 births. In contrast, rural blacks, constituting then about 80 percent of the black population, were found to have a much higher and essentially "natural" TMFR of 7.7 births. Tolnay concluded that the amount of deliberate fertility control among them, estimated by the method developed by Coale and Trussell (1974), was minimal overall but had some interesting variation by age. A fertility reduction of 28.5 percent between the periods 1886–92 and 1893–99 for the 25–29 age group and a 20.1 percent reduction for the 30–34 age group was implied, while the 45–49 year olds were seen as having increased their fertility by 7.7 percent. This pattern is at odds with the observations made of other populations in the earliest phases of fertility decline, wherein the greatest declines occur at later ages among married women as they attempt to contain their childbearing within the lowered range of desired family size (Tolnay, 1981: 456).

Although the point is not made by Tolnay, who observed that the declines could be "partially artifactual" and that the causes were "difficult to specify" (p. 456), the pattern he derives, applying to the earliest stages of a fertility decline, is entirely consistent with that expected in a population in which involuntary subfecundity, associated with sexually transmitted diseases, is beginning to be a force.

The finding of a marked contrast between the urban and rural blacks in their fertility behavior is of importance to the argument over the role of deliberate contraception during the first black fertility decline. Tolnay observed that "the dynamics of reproduction were extremely different for rural and urban blacks" (p. 459) and that for rural blacks the decline from a high, "natural" fertility level did not begin until after about 1896. By this time urban blacks had achieved a considerable reduction in their fertility due at least partly to the use of deliberate family limitation. This explains why McFalls and Masnick (1981) are able to find evidence of contraceptive use in the 1930s among their urban northeastern black groups. But it throws into doubt their contention that contraception was characteristic of all blacks, most of whom at that time were still predominantly rural and southern.

To be convincing, McFalls and Masnick's contention, that the black fertility decline in the United States was related in a major way to the progressively increasing adoption of deliberate contraception during the period of 1880–1940, would have to show that rural, poor, southern blacks were consistently and effectively practicing contraception on a massive scale and why, contrary to well-developed demographic theory, they were doing so. A development of the magnitude necessary to have accomplished the observed fertility decline could scarcely have escaped contemporary observation and would have been likely to find its way into the scientific literature. The paper by McFalls and Masnick contains no evidence, however, that such a development occurred. Their contention, for example, that the 1910 child-woman ratio (CWR) of about 500 among blacks was associated with 35–40 percent birth control use (McFalls and Masnick, 1981: 89, fig. 1) is entirely unsupported. The CWR of blacks living in the northeastern states, about 270 in 1910, was so low that it was probably substantially affected by deliberate contraception, but the effect of this group's fertility on U.S. black fertility as a whole would have been small (see Farley, 1970: 105, table 5-1).

There have been other cases of a culturally separate component within a larger population persisting in its resistance to family planning decades after the majority group completed its transition to fertility control. It happened among the New Zealand Maori, whose fertility characteristics resembled those of their fellow Polynesians in the tropical South Pacific islands rather than those of their modernized neighbors at home–until the 1960s, when they too began a fertility decline related largely to family planning (Borrie, 1959; Pool, 1977).

Social research among rural blacks of the South in the 1930s, by Johnson (1934 and 1941a) and Powdermaker (1939) for instance, substantiated the view that children were strongly desired and that large families were an advantage.

> The large numbers of births would not necessarily prove that the Negroes of the community [a county in the Yazoo River valley, Mississippi] as a rule really want children; but the actions and attitudes of adults toward children, and what most of them have to say on the subject, put it beyond question that they do. . . . children are an economic asset. There is no ban on child labor here, and children are counted as hands or half-hands in the cotton fields. . . .
>
> Children are also considered a form of old-age insurance (Powdermaker, 1939: 199).

And,

> In a system which requires the labor of the entire family to earn a living, children of a certain age are regarded as an economic asset. They come fast, and there is little conscious birth control. The coming of children is "the Lord's will." The number of miscarriages and stillbirths is extraordinarily high and the infant mortality great. There is pride in large families. "Good breeders" are regarded with admiration. . . . For men the size of the family is a test of virility and for women fecundity has tremendous weight in their valuation as mates (Johnson, 1934: 57–58).

Adoption was easy, informal, and frequent, children being welcomed particularly by childless couples but even by families already large (Johnson, 1934: 64).

Neither Johnson nor Powdermaker referred to "family planning" or "birth control" as an important element in rural black culture in the 1930s, although both mentioned contraception briefly. Johnson: "Although contraceptive devices [presumably, in this context, the condom] are frequently used by rural Negro youth, the rates for syphilis and other venereal diseases are high" (1941a: 234). Powdermaker, referring to the work of the recently established county Health Department clinics: ". . . the gradual dissemination of information concerning birth control is likely to reduce the birth rate to some extent" (1939: 199).

The picture emerging from all these studies, which were based on systematic surveys, is of a largely rural population, essentially pretransitional in its fertility preferences, welcoming and being interested in children for reasons characteristic of peasant societies. In addition, most blacks in these surveys seemed to show little embarrassment about children born outside marriage, although this varied rather sharply with class. They were largely oblivious of the utility of systematic contraception or deliberate abortion and apparently saw no need for such intervention, although aware of the possibility. By contrast, the prevalence of venereal diseases, miscarriages, stillbirths, and childlessness is referred to frequently and in some detail in these studies.

The economic plight of most blacks in the southern states is shown as so bad that lack of money would preclude their adoption of any of the more efficient family planning methods then available. We have already mentioned that the prohibitive cost of the condom, for instance, reduced its use by most blacks. Not until the states, using recently available federal funds, began setting up maternal health clinics that dispensed family planning advice and supplies in the 1930s did the situation begin to change. Even then, the assistance was part of a general movement to improve the health status of blacks, for whom assistance of any kind had been previously entirely inadequate. In other words, family planning, in a systematic fashion, was not a part of the lifestyle of the great majority of blacks in the southern states until it was offered as part of a larger package including assistance in combating the problems of pellagra, malaria, tuberculosis, typhoid, venereal diseases, and the other "miseries" which, after Emancipation, the southern black had to endure almost unaided.

VENEREAL DISEASE: THE PATH OF CUMULATIVE INCREASE

There is considerable evidence, of a soft or inferential kind, to suggest that neither syphilis nor gonorrhea was common among blacks during the period of slavery. From 15 works examined alluding to the health conditions of slaves in the United States, we discovered only two that even mentioned venereal diseases. According to Stampp (1956: 303), "syphilis, contracted from the whites, was present in the towns and on scattered plantations but it did not spread rapidly." Flanders (1933: 168) stated that "venereal diseases were not unknown among the slaves." He cited a few examples and reported one county record indicating one slave death (out of 53 reported) had been caused by syphilis (p. 173).

In a fairly detailed description of slave health and alleged lax moral standards, Weatherford (1924: 276) omitted mention of either venereal syphilis or gonorrhea, although he did assert that "there was considerable prevalence of disease on account of sex indulgence–not withstanding popular opinion to the contrary." He then confused the issue by identifying the diseases as "yaws" and "scrofula." Yaws would have been prevalent among blacks in the African humid tropics and in the areas of Central and South America, including the Caribbean islands, with similar climates. The six-state region was not climatically suitable for yaws, however, and over time this infectious but nonvenereal disease would have died out. Yaws confers a substantial immunity to venereal syphilis and could have been a factor in the low incidence observed among slaves, but only among those transported from the humid tropics.

Medical records reflecting the relative incidence of venereal disease at the time of Emancipation are available from the records of the Union Army (1863–66). They show generally low levels among black servicemen: 34 per thousand annually for syphilis and 44 per thousand for gonorrhea. Venereal diseases among white troops were about double these rates (U.S. Surgeon General, 1888: 891). Reviewing the evidence, we tend to agree with Plaut (1927: 2), who asserted that the "general opinion is that Negroes did not suffer from . . . syphilis extensively before their liberation and the occurrence of insanity among them is considered rare."

Although many U.S. historians, writing about living conditions under slavery, faithfully preserve the tone of abolitionist literature, their views have been challenged by some modern historians (e.g., Fogel and Engerman, 1974). Slaves were a major capital investment under the plantation system, and in most cases health and natural replacement were promoted for economic reasons if for no other. However, living conditions and the degree of mobility for most slaves were under the complete control of the owners. A stable, family-based paternalistic situation conducive to high fertility, compatible with the levels observed, would seem to have promoted a more stable work force and therefore higher profits to the slave owner. Certainly, the expectation of life for blacks was short (about 34 years) during the heyday of slavery before 1860, but that of whites was not much longer (about 39 years). To be deprived of the health care available in the first half of the 19th century was not to be put at much of a disadvantage.

Incidence of venereal disease after Emancipation

After the Civil War living conditions for most blacks deteriorated, becoming more conducive to the spread of venereal diseases. Unless free blacks were able to acquire land of their own or find stable employment—and only a small minority could—their lot was usually sharecropping, tenant farming, and rural wage laboring. Conditions of employment began as little better than those prevalent under slavery, and there is evidence that they deteriorated rather than improved with time. Blacks' freedom became the option to move about in attempts to find something better. Poverty, illiteracy, cultural deprivation, marital instability, anonymity, and mobility are usually associated with a high incidence of venereal disease, and they were increasingly characteristic of the black population after Emancipation (Frazier, 1939).

Evidence showing the path of cumulative increase of venereal disease after 1865 is rather scanty. Some observers began noting an upsurge in the numbers of blacks in mental institutions late in the 19th century who suffered from syphilitic paresis.

> The general opinion is that negroes did not suffer from tuberculosis and syphilis extensively before their liberation, and the occurrence of insanity among them is considered rare. Figures are given by Miller, in 1896 [no reference], to substantiate this. He said that in the State of Georgia there were 44 negroes (1:10,584) in the insane asylums in 1860. In 1870 there were 129 (1:4,225), reaching 910 (1:943) in 1890. For the entire United States insane asylum inmates among the negroes amounted to 638 in 1850,

> and to 6,766 in 1890. Insanity, according to these statistics, increased almost 500 per cent among the colored population, while it doubled among the white, between 1860 and 1880. These figures must be taken with some reserve as care for the colored insane set in about this period, while it had existed for the white insane for a considerable period previous to that (Plaut, 1927: 2).

Spontaneous abortions related to syphilis were observed by DeSausser as being "frequent" in South Carolina by 1894 (quoted by Holmes, 1937: 28). Until the results of World War I military examinations were made public, no reasonable estimate could be made of the incidence of venereal diseases among blacks.

Evidence from examinations made during World War I

All men inducted into military services in World War I were examined for venereal disease; but serologic tests for syphilis, though known since 1907, were not given nor were clinical histories taken (U.S. War Department, 1920). The data published were not analyzed by race. Among the second million recruits examined, the presence of two "major defects" was used as the basis for rejection. The data indicate that, overall, 1.0 percent of those examined showed syphilis and 4.5 percent had gonorrhea. The method of examination for syphilis, mainly inspection, would tend to give results very different from the indications of the serologic testing employed during World War II. Only men currently in the first or second stages (those with infections of less than two years' duration) would likely have been identified. Even given the relatively youthful age range of the recruits, many latent cases would have been overlooked. The method used for diagnosing syphilis during World War I resembled that used for gonorrhea. Thus, observed rates of the two diseases were more comparable than they were during World War II, except that, given the longer duration of active syphilis, any one case would be at least three times more likely to be detected in a mass one-time examination than any one case of gonorrhea. Several observed problems, classified as "major defects," were given priority over venereal disease; and these varied with the draft boards concerned, so that the number of infections discovered would be higher than the number given in the reports, although we cannot say by how much.

The six states with the highest reported rates of venereal disease were those of our study area—that is, the states with the highest

TABLE 2. Reported rates of venereal disease among the "second million" U.S. servicemen examined in World War I
(Rate per thousand examined)

State	% black (1920)	Syphilis	Gonorrhea	All venereal diseases
Florida	34.0	22.4	134.2	163.3
Georgia	41.7	28.9	101.7	135.6
Mississippi	52.2	22.2	106.6	132.4
South Carolina	51.4	16.5	109.9	131.3
Louisiana	38.7	33.1	85.7	121.1
Alabama	38.4	37.9	73.5	114.7
All United States	9.9	10.5	44.7	56.7

NOTE: Although military records refer to two million servicemen, in fact 1.8 million were examined.

SOURCE: United States War Department (1920: 104–5).

proportions of blacks (Table 2). The data do not indicate what proportion of the venereal disease observed was associated with the blacks examined, but admissions of all U.S. servicemen for treatment of venereal disease in the 1917–19 period showed that blacks had a five-to-one ratio over whites (Table 3).

Although venereal disease and military life are notoriously associated, within the United States it is probably reasonable to assume that each group acquired most of its infections from within its own community. Thus the relative, though not necessarily absolute, incidence of the disease among military personnel should be a fair indication of levels in the respective civilian populations. Rates among black servicemen of over 400 cases per thousand annually for gonorrhea and over 100 cases per thousand annually for syphilis must have dismayed the military authorities of the time. Syphilis levels were three times those observed in the Civil War and the gonorrhea level approached ten times the Civil War level.

Although few men diagnosed as having syphilis were rejected from military service in World War I, military authorities had a policy of sending only troops free of the disease to Europe. Therefore, most of the cases hospitalized there would have been locally acquired and, again by policy, severe. Black servicemen were subjected to special precautions against syphilis. On returning to their bases, they had to

TABLE 3. Annual admissions for treatment of venereal disease among U.S. servicemen stationed in the United States, in Europe, and all locations, by race: 1917–19

U.S. servicemen by location of assignment and race	Annual admissions per 1,000		
	Gonorrhea	Syphilis	All venereal diseases
United States			
White	75.9	17.7	101.1
Black	424.5	111.1	589.5
Ratio: black to white	5.6:1	6.3:1	5.8:1
Europe			
White	15.9	5.9	27.9
Black	20.3	16.7	57.5
Ratio: black to white	1.3:1	2.8:1	2.1:1
All locations			
White	49.5	12.6	66.9
Black	232.0	65.0	331.6
Ratio: black to white	4.7:1	5.1:1	5.0:1

SOURCE: Mitchie (1928: 264, 272, 293).

submit to inspection and to intense scrubbing and disinfecting of their genitalia. Whether these primitive measures were effective, which seems unlikely, or whether this humiliating prospect made black soldiers less inclined to leave their bases, their rates of infection in Europe remained low (Siler, 1943: 103).

The change from the situation observed before and during the Civil War, when the venereal diseases presented little problem, to that observed in World War I, when the problems had become obviously considerable (though impossible to quantify precisely), indicates that over the 50-year period the incidence of both syphilis and gonorrhea among blacks had increased dramatically.

The interwar years

After World War I, increased serologic testing began to reveal the magnitude of the syphilis problem among blacks. For instance, between 1929 and 1932, the Rosenwald Foundation conducted serologic tests on the entire black population in six southern counties. (For reports of the results of individual counties, see Hazen, 1947; Fellows and Perry, 1941; Wenger, 1929; Crabtree and Bishop, 1932.) The level of positive tests was approximately 19.5 percent overall, ranging from 35.0 percent in Macon County, Alabama, to 11.5 percent in Albemarle County, Virginia (Hazen, 1947: 7). It is noteworthy that the blacks in Macon County were mostly poor tenant farmers, whereas a high proportion of those in Albemarle County were relatively prosperous and residentially stable farm owners. Overall, the proportions of males and females who showed positive reactions were about equal, a situation also found in most other surveys. Among adults of reproductive age, the proportion showing positive reactions was much higher than these overall figures.

Serologic testing during World War II

Any doubts about the seriousness of the syphilis problem among blacks were dispelled by the results of serologic testing of the first 1.9 million men examined by the Selective Service during World War II. In this representative sample of young civilian males, some 1.7 percent of whites and 25.2 percent of blacks showed positive or doubtful reactions to the tests (Vonderlehr and Usilton, 1941a: 1371).[2] When standardized for the age distribution of the U.S. male population 21–35 years old, the adjusted rates are 2.2 percent and 27.2 percent respectively. Among blacks of ages 31–35, 36 percent showed positive or doubtful reactions.

Peak rates and the beginnings of control

The data do not allow a precise description of the growth of the venereal disease problem among blacks between the Civil War and World War II. However, those assembled here (only a fraction of the data available) indicate an upward trend to the very significant level suggested for syphilis by 1917–18, a continuing upward trend throughout the 1930s, and the dimensions of an epidemiological disaster when examined systematically, at last, in the early 1940s.

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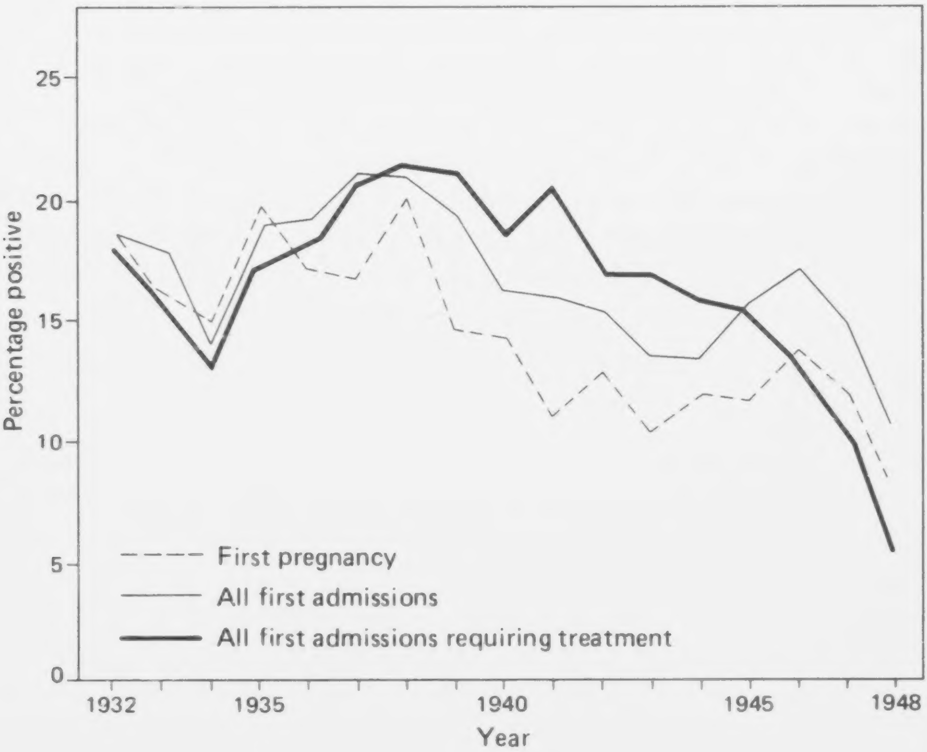
[2] Both positive or doubtful reactions were used by Vonderlehr and Usilton to determine the prevalence of syphilis, because a 1941 evaluation of the tests indicated that less than 0.3 percent of positive reactors were found in known nonsyphilitic blood samples, whereas 10 to 15 percent of known syphilitic blood samples gave negative results. The investigators believed the incidence rates would have been higher had an infallible test for syphilis been available (p. 1372).

Although the data for gonorrhea are much less substantial, the pattern of this disease among blacks is assumed to be similar in form but, in number of individual infections contracted, somewhere between four times and eight times higher than that for syphilis. The incidence of gonorrhea among males and females is assumed to have been approximately equal, as it was for syphilis. By the late 1930s, at least 35 percent of blacks contracted syphilis before reaching the age of 35. If gonorrhea was four times more prevalent than syphilis, it is reasonable to assume that the number of gonorrhea infections suffered was at least 1,400 per thousand by the same age; but it could have been as high as 2,800 per thousand.

Some years prior to the entry of the United States into World War II, syphilis began to recede. The peak years seem to have been 1936–38. Given that decisive cures for both syphilis and gonorrhea were not available before the 1944 discovery that penicillin was effective against both diseases, this reduction requires some investigation. There is a considerable amount of evidence on the topic, but it tends to be fragmentary and often circumstantial.

In Mississippi, for instance, women attending six prenatal clinics showed a decline in positive syphilis reaction beginning in 1938 and continuing in a modest but unmistakable way until 1945–46, when the decline became dramatic. This response was probably due to the local introduction of antibiotics (Figure 2). Among Mississippi blacks, infant mortality from syphilis fell from a peak of 2.8 per thousand in 1936 to 1.0 in 1943 (Gray, Usilton, and Iskrant, 1950: 225). A marked drop in the proportion of positive reactions was noted among blacks taking premarital serologic tests in Chicago between 1937 and 1940 (Hazen, 1947: 13). Further evidence that the incidence of syphilis among blacks was declining before the introduction of antibiotics may be derived from the examinations of the Selective Service. Among the first million men examined in 1941, 1.8 percent of whites and 24.1 percent of blacks had positive serologic reactions. Between April 1942 and December 1943, 2.1 percent of whites and 21.5 percent of blacks had positive reactions. Usilton collected Selective Service serologic examination data and divided them into six periods of three months each covering January 1942 to June 1943. She noted a

FIGURE 2. Proportion of black women with syphilis or requiring treatment for syphilis at six prenatal clinics: Mississippi, 1932–48



SOURCE: Gray, Usilton, and Iskrant (1950:228–29).

clear downward trend in this period for both blacks and whites in all age groups in the South (Usilton, 1945: 266).

Two speeches made by Dr. Thomas Parran, then Surgeon General of the U.S. Public Health Service, and Dr. R. A. Vonderlehr, Deputy Surgeon General in charge of the Division of Venereal Diseases, U.S. Public Health Service, in February 1943 (Parran, 1943; Vonderlehr, 1943) provide an insight into the contemporary thinking of those in charge of the, by then, massive effort against venereal diseases. Parran's views are quoted here.

> It was only a few years ago that the nation finally began to realize that syphilis and gonorrhea are prime wasters of manpower, that they do

> enormous human damage, cost enormous sums. It is fortunate that we began to tackle this problem aggressively prior to the onset of war. The basic strategy of the campaign is simple: break the long chain of infections from one person to another. . . . Simple in concept, the execution of this strategy has been complicated. It has required the training of an army of skilled workers, the establishment and upgrading of laboratories, the securance of Federal, State and local money, the passage and enforcement of laws, the mobilization of community support, the organization of treatment centers and hospitals, and coordinated research to develop improved control methods (Parran, 1943: 141).

Some of the measures involved were the passage of the National Venereal Disease Control Act in 1938. From that year, the amount of money applied increased annually until 1943, when Parran announced that $25 million were being spent on VD control "in 3,000 communities in every state" (p. 142). From 1938 to the end of 1943, 1.54 million cases of syphilis and gonorrhea were admitted for treatment, "a large part of which were in the early and infectious stages which can be made noninfectious in a relatively short time" (p. 142).

Parran also referred to progress in treatments.

> Through recent advances in medical science, a quick and certain cure is assured for 80–90 percent of patients with gonorrhea. Several new short treatments for syphilis give great promise of success. One or more of them may supplant traditional methods (p. 142).

Vonderlehr went further and, referring presumably to the effect of penicillin on syphilis, declared:

> For gonorrhea we have the almost miraculous sulfa drugs, a new development which should permit us to eliminate that disease completely in a comparatively short time. For syphilis there are emerging from the experimental stage several new treatments which may mean the same thing for syphilis as the sulfa drugs mean for gonorrhea (1943: 203).

In 1942, 13.8 million sulfa tablets were given to gonorrhea patients. Other measures against venereal diseases included a vigorous campaign to close houses of prostitution. The May Act of 1941 put federal teeth into this movement, which was designed particularly to reduce the risk of acquiring venereal diseases in the vicinity of military bases and installations. Since 1939, however, the intentions of this act had been anticipated in most places by local authorities, and the May Act was invoked only rarely.

Parran, speaking in Atlanta, Georgia, also said, "We are deep in that region of the nation where attack by venereal diseases has been most severe and where recent counterattacks have been most vigorous" (p. 143). He quoted figures for the state showing progress from 1939 through 1942. For example, the number of VD clinics had risen from 128 to 224, the number of syphilis patients treated per month had increased from 12,794 to 27,128, and the number of serologic tests administered annually had doubled (from 242,698 to 488,474). In 1942 the number of gonorrhea patients under treatment showed an increase of 241 percent over 1941. Parran singled out Florida for special mention as a neighboring state taking "great forward steps" and also mentioned "steady progress" in Louisiana, Mississippi, and Alabama.

From these accounts of progress, the impression of optimism and vigor, in contrast to previous alarm and dismay, is unmistakable. One of the themes struck by both Parran and Vonderlehr was that it was a patriotic duty of all citizens to help in the fight against venereal diseases since, because of their disabling effects, they impaired the war effort.

While it may be true, as McFalls suggests (1973: 9), that before 1944 no treatment was "completely satisfactory" for either gonorrhea or syphilis, in 1943 this was evidently not the opinion of two of the nation's most influential physicians. Whatever we may think of the sulfa drugs now in comparison with the extremely potent antibiotics of the present day, in the late 1930s and early 1940s they were considered "miracle" drugs that were particularly effective and widely used against gonorrhea. McFalls mentions their frequent use by the poor (particularly blacks), who obtained sulfa drugs directly from pharmacists and not by way of a physician's prescription. Hit-or-miss applications and toxic reactions aside, the widespread use of sulfa drugs in the late 1930s is the best explanation we have for the coterminous increase, slight though it was, in black fertility.

The ability of sulfa drugs to reduce or prevent the complications associated with gonorrhea must have been more effective than McFalls admits. And it is the complications that reduce fertility; the disease itself need not be cured. Gisslen, Hellgren, and Stark (1961: 370) found that, in Finland before the introduction of sulfanilomide, 14 percent of female gonorrhea patients developed salpingitis. With sulfanilomide treatment, the incidence was reduced to 2 percent. In males, the incidence of epididymitis dropped from 17 to 12 percent. It is likely that McFalls also underestimates the effect of preantibiotic preventative activities against syphilis. The treatments given to syphilitics and the breaking of the "chain of infections" by social action must have had some effect.

In the areas surveyed by the Rosenwald Foundation, persons identified in the original surveys as having positive reactions were given treatment. In Albemarle County, Virginia, between 1931 and 1938, the rate for positive reactors dropped by 41.5 percent for males and 25.1 percent for females. In Pitt County, North Carolina, where 17 to 20 percent of all young black adults had positive reactions in 1930, premarital tests in 1939 indicated that the rate had been reduced by half. The black stillbirth rate in Glynn County, Georgia, dropped from 146 per thousand live births in 1930 to 65 per thousand in 1939 (Hazen, 1947: 10–11). Among blacks examined between October 1940 and April 1941 in Macon County, Alabama, the Selective Service found only 12.9 percent to be suffering from syphilis. In 1930 the level had been 35 percent.

After 1937, blood tests were required by some states for all marriage license applicants. By 1945 some 36 states had this requirement. In 1938, 3.5 million tests were given in the United States for syphilis; by 1942 the level had reached 20 million (Vonderlehr, 1943: 203). Between 1937 and 1942, 30 states passed laws requiring special prenatal care for syphilitic mothers. The incidence of congenital syphilis began to decline rapidly. The military authorities accepted draftees found to be syphilitic provided the men could respond to treatment then available.

After the introduction of antibiotics, treatment for several illnesses, including syphilis, probably had a serendipitous effect on gonorrhea as well. This effect was noted in the South Pacific, where gonorrhea receded dramatically after the populations were subjected to mass campaigns against yaws that included the use of antibiotics (Pirie, 1972: 199).

Some surprise and scepticism have been expressed that the results of control can be so suddenly reflected in rising fertility (e.g., McFalls, 1973: 12), but this effect may be further diagnostic evidence of gonorrhea. Since so much of the effect is concentrated in the early childbearing years, the sudden removal of the cause of infertility will just as swiftly and drastically improve the fertility of the group normally the most fecund. For instance, if the "normal" 20–24-year fertility rate observed among the Malays in 1957 is substituted for the "depressed" rate of the blacks shown in Table 1, the TFR rises from 3.1 to 4.0 (29 percent) in five years.

In summary, there is good reason to believe that the decline in the incidence of venereal diseases among blacks became discernible in the late 1930s, and this decline in turn promptly affected their fertility. The TFR for blacks rose from a nadir of 2.7 in 1936 to 3.0 in 1945 and then rapidly to a peak of 4.7 in 1957. Thereafter, it began a decline, still continuing, which we attribute largely to deliberate family limitation, a movement toward the completion of the genuine demographic transition of the U.S. black population.

GEOGRAPHIC PATTERNS OF VENEREAL DISEASE AND BLACK FERTILITY

Although the circumstantial and historical evidence on the venereal diseases assembled so far makes a compelling case for the likelihood of a strong effect on the fertility of U.S. blacks, it is possible to make a stronger link between the two by using geographical techniques. Here we utilize the theory that, if areal variations in fertility and the incidence of venereal diseases are correlated within the six-state region shown in Figures 3 and 4, and if these two variables can be related to the distribution of particular economic or social factors, we shall have been able to establish a causal connection between them.

The possibility of making these connections directly is limited by available data to the year 1940. The likelihood of war in that year moved the U.S. Selective Service to examine medically a large number of young American males. Included in the examinations (totaling some 2.1 million up to August 31, 1941) was the serologic test for syphilis referred to previously. The results of these examinations have been published by the U.S. Public Health Service (1942 and 1943). The data are tabulated by age and race at the state level; unfortunately, the data were not published by race at the county level. From other sources, we were able to discover data tabulated by race at the county level, but only for Florida and Alabama. The time period is similar to, but not the same as, that for the state-level data (Gill, Smith, and Damon, 1943; Sonday, 1944).

Using these data as a basis for estimating the incidence of syphilis among blacks by county for the six selected states, we assumed that the relative incidence of white versus black syphilis rates at the state level would also apply at the county level, and that blacks in a given

FIGURE 3. Location of counties and urban areas discussed in text: six southeastern states of the study

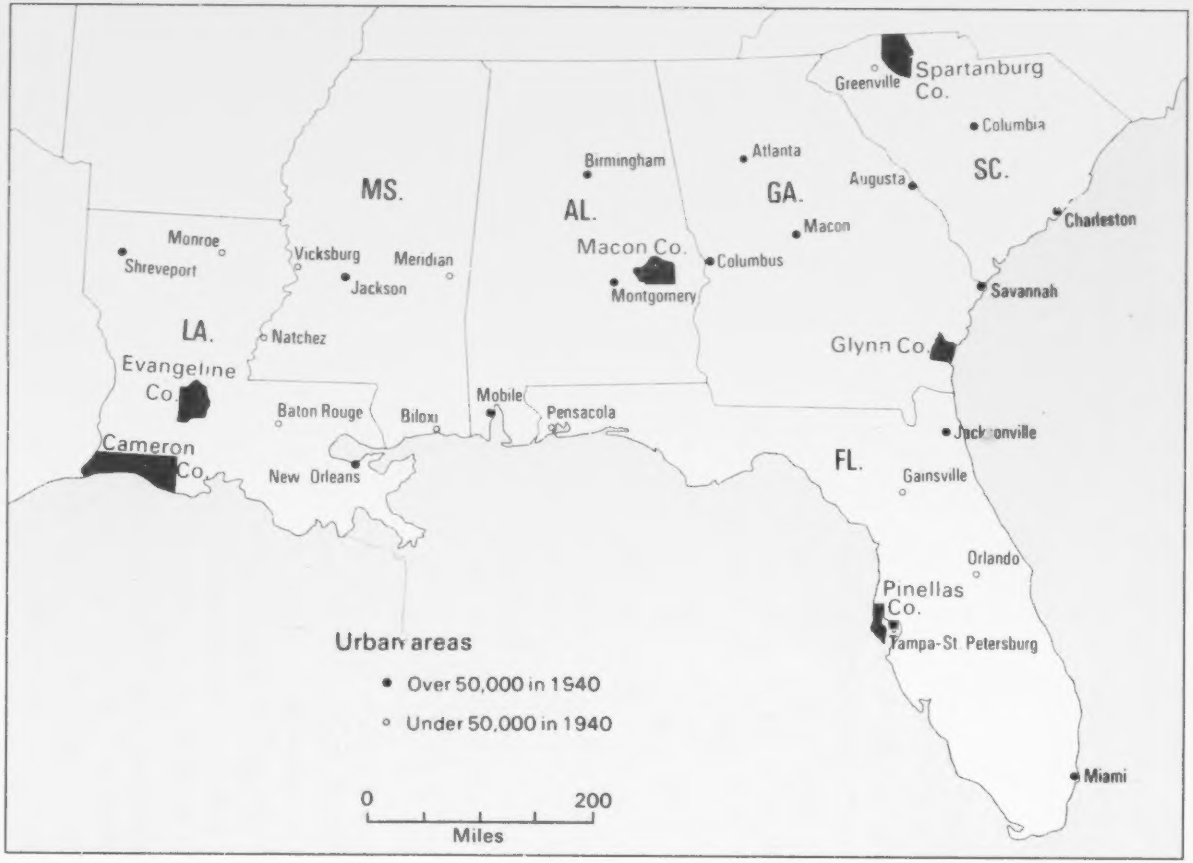

Spartanburg Co.
Greenville
Columbia
SC.
Charleston
Atlanta
Augusta
GA.
Macon
Birmingham
AL.
Macon Co.
Columbus
Montgomery
Savannah
Glynn Co.
MS.
Vicksburg
Meridian
Jackson
Monroe
Shreveport
LA.
Natchez
Evangeline Co.
Baton Rouge
Biloxi
Mobile
Pensacola
Jacksonville
Cameron Co.
New Orleans
FL.
Gainsville
Orlando
Pinellas Co.
Tampa-St. Petersburg
Miami
Urban areas
● Over 50,000 in 1940
○ Under 50,000 in 1940
0
200
Miles

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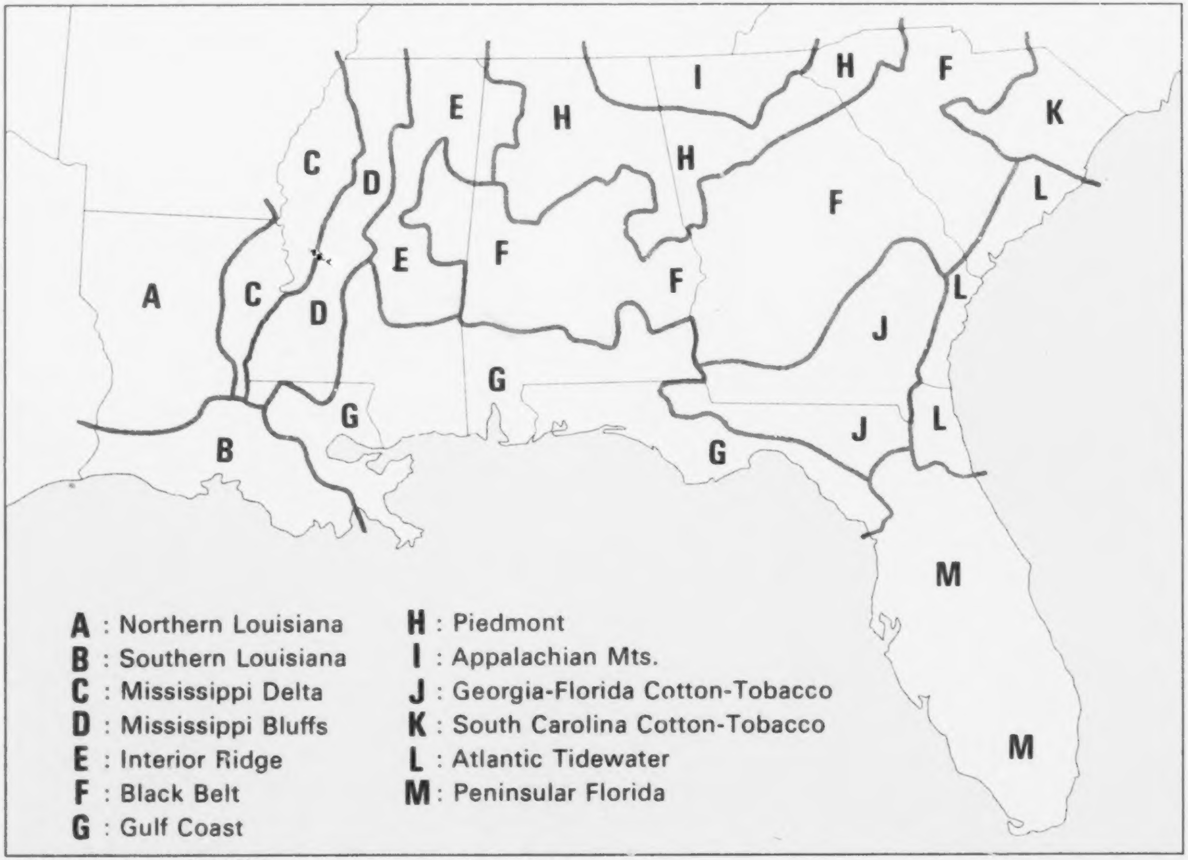
FIGURE 4. Location of economic regions within the six southeastern states


A : Northern Louisiana
B : Southern Louisiana
C : Mississippi Delta
D : Mississippi Bluffs
E : Interior Ridge
F : Black Belt
G : Gulf Coast
H : Piedmont
I : Appalachian Mts.
J : Georgia-Florida Cotton-Tobacco
K : South Carolina Cotton-Tobacco
L : Atlantic Tidewater
M : Peninsular Florida

SOURCE: Odum (1936) for economic-region boundaries.

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county were examined in proportion to their share of the population in the county. We were able to check on the probable accuracy of our estimates by comparing those derived using this method for Alabama and Florida with the true recorded rates for these two states. The correlations between the estimated and actual rates of syphilis among blacks at the county level were +.87 for Florida and +.89 for Alabama. These correlations are sufficiently high to support the assumption that most of the estimated rates are close to the true figures. Gross errors are most likely in counties with low proportions of blacks or where only a few persons were tested. In some counties, fewer than 50 were examined. From these data we estimated the incidence of syphilis among blacks examined by the Selective Service during the period from November 1, 1940, through August 31, 1941 (Figure 5).

Several distribution characteristics are immediately apparent from this map:

1. Peninsular and panhandle Florida stand out as areas of very high incidence. Most of the counties exceed a 42 percent syphilis rate.

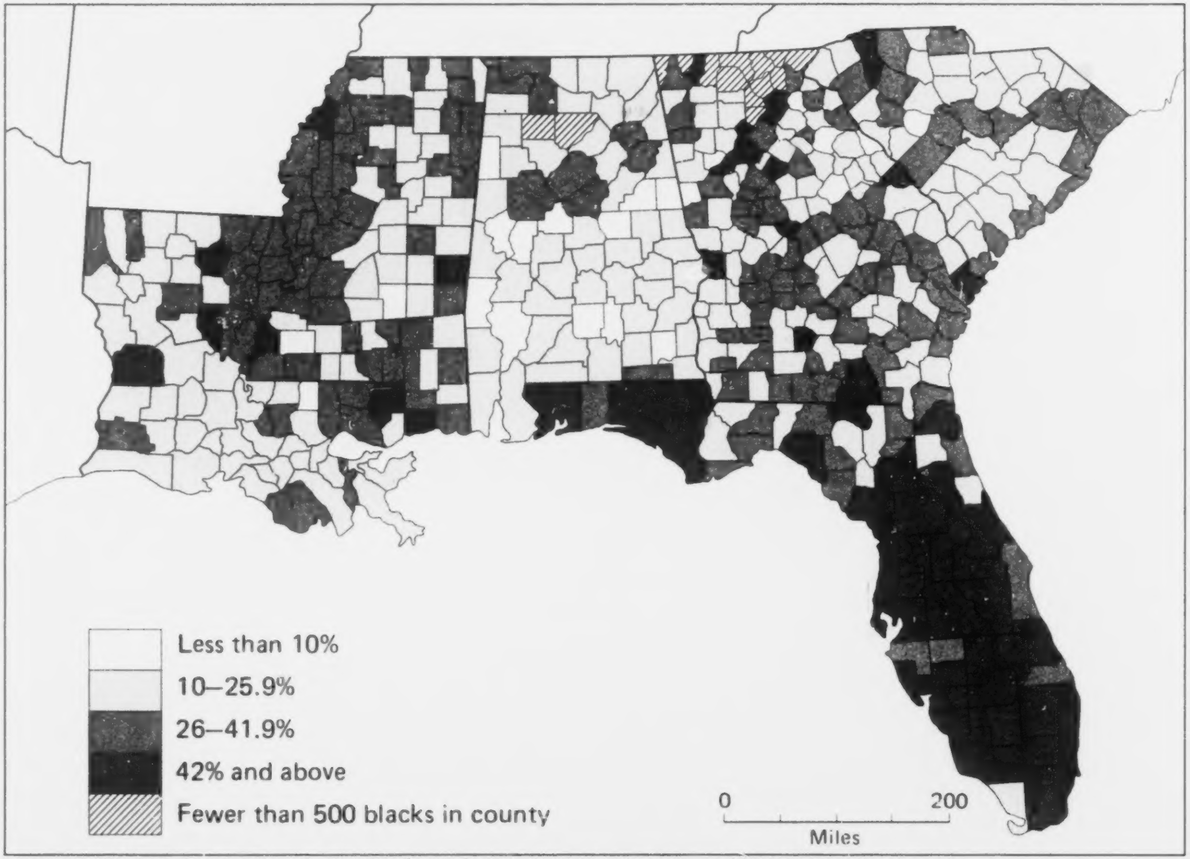
2. The Mississippi Valley Delta and Bluffs regions appear as areas with high incidence. Most of the counties show a rate in the range of 26–41.9 percent.

3. Counties containing or adjacent to the larger cities in the southern states (e.g., Atlanta, Georgia) frequently show higher rates than surrounding rural counties. (For locations of major cities, see Figure 3.)

4. Southern Alabama shows lower levels of syphilis than surrounding areas. Given the high levels indicated for this area in several small-scale studies, this finding is surprising. There is no reason to believe that the social and economic conditions prevalent in southern Alabama should have resulted in low rates of venereal infection. Possible explanations include a recession of the disease after extremely high levels in the recent past or a systematic bias in our data for this state. Given the local independence of draft boards, the latter explanation is more likely. We have found little evidence that Alabama was in the forefront of those states endeavoring to combat syphilis in the years prior to 1940, certainly not to the extent indicated here.

Using syphilis as a surrogate for other sexually transmitted diseases, We compared its distribution in 1940–41 (Figure 5) with the distribution of fertility. Figure 6 shows the estimated total fertility rates for black women in 1940 adjusted for underregistration of births. The

FIGURE 5. Estimated incidence of syphilis, by county, among black males examined by the Selective Service: six-state region, November 1940 through August 1941


Less than 10%
10–25.9%
26–41.9%
42% and above
Fewer than 500 blacks in county
0
200
Miles

SOURCES: U.S. Public Health Service (1942); Gill, Smith, and Damon (1943); Sonday (1944).

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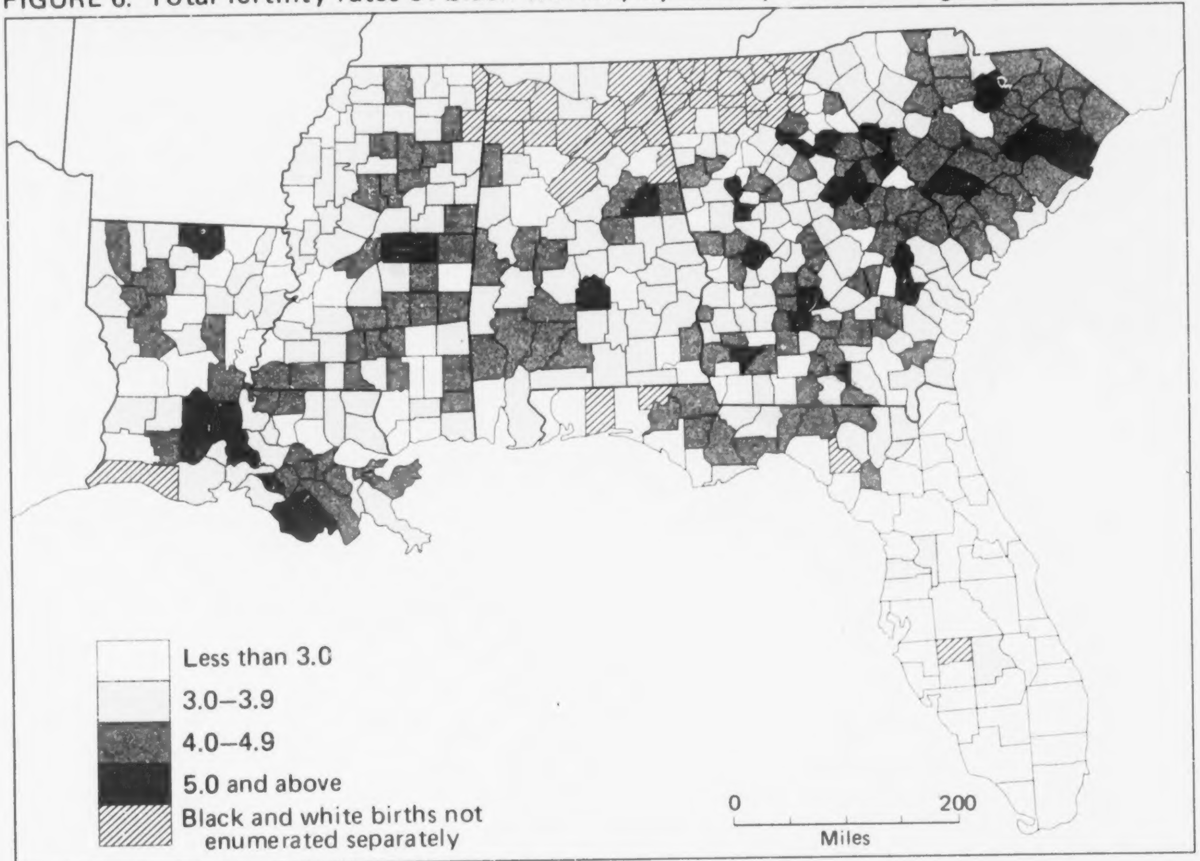
FIGURE 6. Total fertility rates of black women, by county: six-state region, 1940


Less than 3.0
3.0–3.9
4.0–4.9
5.0 and above
Black and white births not enumerated separately
0
200
Miles

SOURCES: U.S. Bureau of the Census (1943a, 1943b, 1945).

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resemblance between the two distributions is striking. Peninsular and panhandle Florida stand out as areas of very low fertility, most counties showing a TFR of less than 3.0. The Delta and Bluffs areas of the Mississippi Valley emerge as having low fertility, virtually all counties having TFRs of less than 4.0 and many with less than 3.0. Counties containing larger urban areas stand out as areas of low fertility, most with TFRs of less than 3.0. In contrast, counties showing higher fertility, with TFRs of 5.0 or more, are concentrated in the "Black Belt" region and in Southern Louisiana and, without exception, are predominantly rural.

Although there is no shortage of anomalies, which appear when Figures 5 and 6 are compared county by county, these are to be expected given the uncertainty of our data and the arbitrary classes used in our mapping classification. Nevertheless, the resemblance between the two distributions is sufficiently great to suggest a strong relationship. For instance, of the 61 counties showing the highest syphilis incidence (42 percent and above) in Figure 5, 47 (or 77 percent) also appear in the lowest fertility class (TFR less than 3.0) in Figure 6.

Although in the six-state region the black population was predominantly rural, poor, and with little economic security in the late 1930s, there were internal variations that seem to bear on the distributions of fertility levels and of venereal-disease incidence just discussed. In Florida, the most affected, the lives of blacks were often very different from conditions found in the other states. Casual laboring, much of it itinerant, was characteristic of the economic opportunities available there to blacks. These jobs were related to the large commercial citrus and vegetable enterprises that were becoming the dominant form of agriculture. Almost two-thirds of the black males employed in agriculture were laborers; in many peninsular counties the proportion exceeded four-fifths. Nearly half of the black population in Florida was urban at this time, a much higher proportion than in the other five states. Although on the average probably better off monetarily than their rural counterparts, urban blacks at this time were subject to intense discrimination, persistently high levels of unemployment, and job insecurity aggravated by the Depression of the 1930s. The mixture of poverty, mobility, and anonymity characteristic of the blacks' lives in Florida, rural and urban, provide ideal conditions for venereal diseases to thrive; and we attribute major responsibility for the phenomenal levels of both the diseases and the consequent low fertility to these adverse social and economic conditions.

In the Mississippi Valley, in the region known as the Delta, conditions that may be related to the unusually high disease rates and low fertility were characteristic. More than two-thirds of the total population in this area was black, and the overwhelming majority of blacks (95 percent) lived on rural farms as tenants who stayed at one location for only short periods. According to Powdermaker (1939: 141), most sharecroppers in this region moved after only one year and a landlord was pleased if he could get the same tenant to stay for two years. Cotton growing was virtually the only agricultural activity, but, despite the productivity of the land, living standards were extremely low—the lowest of any region in the nation (Mangus, 1940: 22). The adjacent Mississippi Bluffs area showed similar characteristics, although the black proportion of the population was smaller (52 percent) and the proportion of black farm operators who were tenants was somewhat less (85 percent). The local economy was not quite so dependent upon cotton.

Many of the larger urban areas of the six states show up as having low fertility and a high incidence of venereal disease. In Florida, counties containing the major urban areas of Miami, Tampa, Pensacola, Jacksonville, and Orlando are examples. In this state, the rural counties are similarly affected so that the rural-urban contrast is not so marked. In other major cities in the South, the consequences of urban living on syphilis prevalence are more apparent. Examples include Atlanta, Savannah, Macon, Columbus, Augusta, and Gainesville in Georgia; Greenville (but not Columbia or Charleston) in South Carolina; Natchez, Biloxi, and Meridian in Mississippi (but Jackson and Vicksburg were not in the class of highest syphilis incidence). In Louisiana, Monroe appears as an extreme case; but New Orleans, Baton Rouge, and Shreveport all appear as having "high" rather than "very high" rates of syphilis. In Alabama, the urban areas of Birmingham, Montgomery, and Mobile appear to have had low fertility, but only industrial cities of the Piedmont, notably Birmingham, were reported to have high rates of syphilis. The low syphilis rate reported for Mobile, a large port city replete with U.S. Navy installations, is especially dubious.

On the whole, the living conditions for blacks were probably best in the rural counties of the Piedmont area. Slavery had been less common in this area, and blacks were not subjected to discrimination of the intensity found further south. Blacks constituted only about one-sixth of the population, and about one-fifth of black farm operators were owners. In the adjacent Appalachian region, there were few blacks in most counties, too few to be considered for our analysis. Southern Louisiana, another area of relatively higher fertility and low venereal-disease incidence, provided living conditions for blacks rather different from elsewhere in the South. About a third of the population was black and the rate of tenancy quite high (about 70 percent), but many blacks worked on large sugar plantations or were engaged in growing rice. Living conditions were not good, partly because of the decline of the sugarcane industry; but this area was culturally distinct, being predominantly Roman Catholic and, in the case of whites, Arcadian. Mobility of the black farm tenants was severely limited by poor roads, marshy topography, and the lack of alternative opportunities.

Another area in which venereal disease seems to have had a relatively mild effect was the Interior Ridge region of Mississippi. Here, although most farms were small and economically marginal, the proportion of blacks who were owners was higher (about one-third) than in most other regions in the South and the proportion of blacks fairly low (about 20 percent). Although not well off, many black farm families in this region were included in small but stable communities. A similar situation existed in the tobacco-growing region of eastern South Carolina. Again, about one-third of the black farmers were owners, although their proportion of the total population was much higher than in the Interior Ridge in Mississippi.

This relatively hygienic situation extended into the northern part of the Atlantic Tidewater region, where along the South Carolina coastal strip black farm ownership was the highest in the six states. Unfortunately, this situation did not extend into the Georgia and Florida sections of the Atlantic Tidewater region, which showed much higher levels of disease and reduced fertility, particularly in the vicinity of the coastal ports.

Of the other regions of the South, the Black Belt, extending from Mississippi through central Alabama and Georgia into South Carolina, was overwhelmingly rural and about 60 percent black. Close to 90 percent of the black farm operators were tenants. In contrast to the prevailing situation in the Mississippi Delta, the average black tenant stayed at one farm for about six years (Woofter, 1936: 110). Living standards, although low, were not so insecure or erratic as in Peninsular

Florida or in the Delta region. The local economy was heavily dependent upon cotton. The pattern of syphilis occurrence was patchy, some counties recording less than 10 percent infection levels but most with levels in the 10–42 percent range, rising above it only rarely except in counties containing the larger urban areas. The distribution of fertility levels showed a similar pattern, mostly between the extremes, with a mean TFR of about 4.0.

Conditions along the Gulf Coast, a large region extending from the mouth of the Mississippi east into northwestern Florida, were varied. Cotton was not dominant as it was further north, and there was considerable development of fruit and vegetable growing. Settlement ranged from large ports, such as New Orleans and Mobile, to isolated fishing villages along the Louisiana coast and bustling seaside resorts in Florida. Blacks constituted only about 30 percent of the total population, and approximately 60 percent of those living on farms were tenants, a low proportion compared with the other regions. Overall, however, this benign influence on black health seems to have been counteracted by the relatively high level of urbanization and the nature of much of the paid employment available to blacks, for instance in the lumbering and fishing industries. Venereal disease rates tended to be high and fertility correspondingly low in most counties.

The only part of Florida consistently showing less than devastating syphilis levels and correspondingly low fertility was the cotton and tobacco growing region in the north, extending into southern Georgia. Even here conditions were poor, but the pattern was uneven. The cotton industry had been ruined by the boll-weevil infestation of the 1920s, and farmers had switched mainly to tobacco but also to peanuts. About a quarter of all black farm operators were owners, and blacks accounted for about one-third of the population. Many were employed in the lumbering, resin, and turpentine industries.

Somewhat parallel conditions existed in Northern Louisiana, except that cotton was still the major crop. The levels of black tenancy; the proportion of blacks in the population; the availability of nonfarm rural employment, mainly in forest industries; and blacks' fairly high but patchy levels of syphilis occurrence and apparent fertility impairment were similar.

VENEREAL DISEASE, FERTILITY, AND SOCIOECONOMIC CONDITIONS: 1940

The levels of venereal disease existing in 1940 must have approximated the worst case. Although syphilis began to recede in the country as a whole after 1937, by 1940 the improvement would scarcely have had a perceptible effect on its areal distribution or intensity in the South. Similarly, the distribution of TFRs in 1940 shows levels of fertility at or near their lowest for most counties. We have shown not only that these two distributions are related areally, but also that they are both in turn a reflection of the spatial variation in black living standards at the time. Where blacks lived predominantly in stable family situations, in small rural communities, preferably owning their own farms, or at least remaining at one location for long periods, even if in poor economic circumstances, their fertility was likely to be relatively high (TFR 4.0 or above) and their incidence of venereal disease correspondingly low. Where they lived in unstable conditions, subject to frequent mobility, separation of families, insecure tenancy or employment, jobs such as forestry or fishing that required the relative isolation of males (with the consequent fostering of prostitution), itinerant laboring, casual hiring in towns (and especially in cities, where individuals were even more anonymous) and frequent bouts of unemployment, venereal diseases became rampant and fecundity impaired. Although this relationship between the socioeconomic conditions of blacks has been traced here necessarily at only a general level, and more intensive research on these linkages remains to be done, the outline is clear enough for the purposes of the present paper.

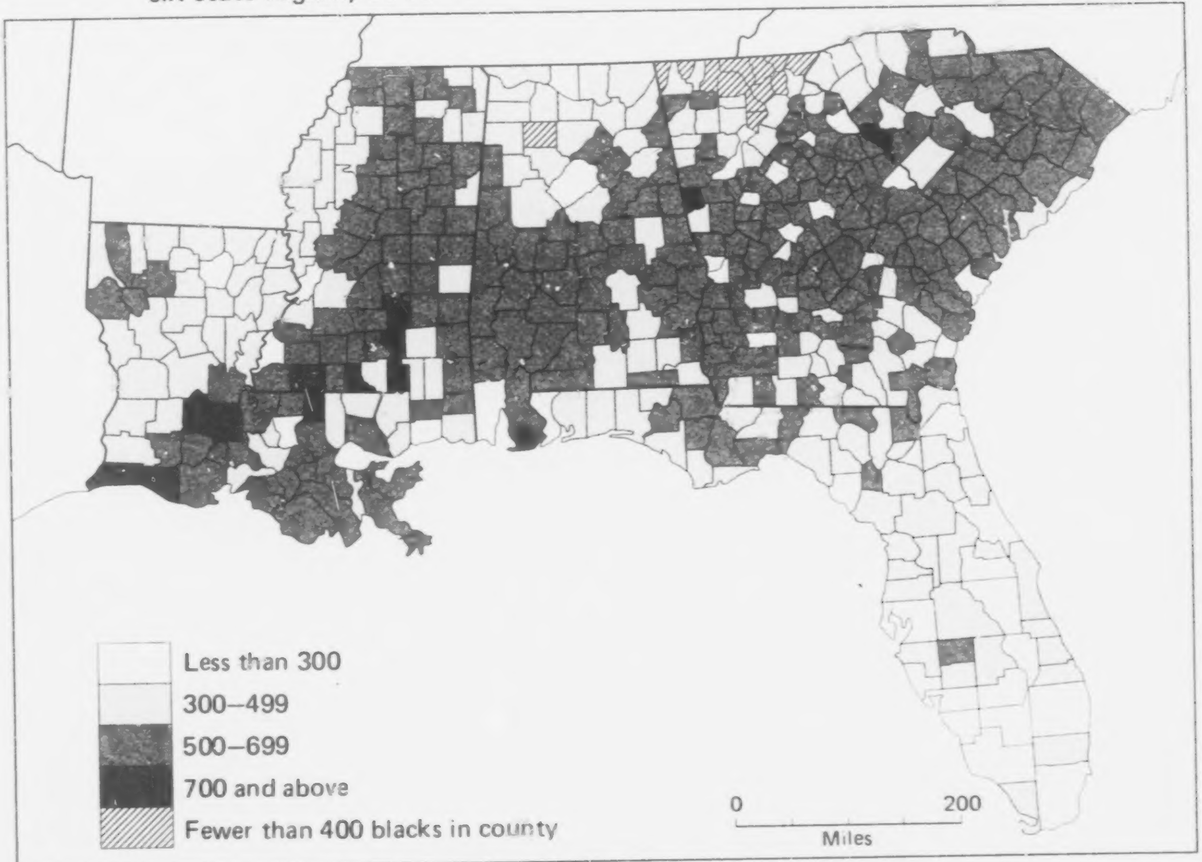
The accuracy and completeness of birth registration during the period under review left much to be desired. In the 1940 census, enumerators were asked to fill out a card on each infant four months old or less, and these cards were later matched with the registration-of-birth records. To the extent that cards could not be matched with birth records, births were considered to be underregistered. Estimated completeness of birth registration among blacks in the six states ranged from 71.7 percent in South Carolina to 86.4 percent in Florida (Grove, 1943: 2). In some counties estimates of completeness were very poor, as low as one-third. The lowest estimates occurred in counties with computed TFRs of more than 5.5, and we suspect that some of those estimates were too conservative. In some counties, usually those containing fewer than 5,000 blacks, the accuracy of enumeration was estimated on the basis of fewer than 20 infants and so was subject to considerable random error.

As a check on the fertility distribution derived from the estimated TFRs, we computed the ratio of children 0–4 years old to females of ages 15–44, the child-woman ratio (CWR). Although theoretically the CWR, which is normally used as an index of population replacement, is inferior to the registration-based TFR as an index of fertility, we came to regard it as a more consistent indicator of black fertility variation in the South in this instance; the pattern of fertility for 1940 derived from the CWR data is shown in Figure 7. The CWR has the advantage of being available on a comparable basis for other census years after 1930, the first census for which age data on blacks by county were published. Furthermore, whereas the 1940 TFRs were derived on the basis of completeness, estimations derived from counts of infants under four months of age, the CWR is based on all children under five years of age. For small counties, therefore, the CWR is less subject to random error than the estimated TFR. All child-woman ratios used for individual counties in this study are indirectly standardized on the basis of the child-woman ratios of all U.S. black females in five-year age groups as reported in the census child-woman ratio reports.[3] The standardized CWR used as an index of fertility has limitations. For instance, the median age of the children enumerated in the census in the 0–4 age group is approximately, but normally

---

[3] For the years 1930 and 1940, we standardized the CWRs on the basis of the number of children under five years of age per 1,000 black females in each age group from 15 to 44 as reported in the U.S. Bureau of the Census (1945: 12). We used the national age-specific ratios with the five-year age groups for a given county to compute what the CWR would have been if the age-specific ratios had been the national ones. We then divided this computed CWR for all women of ages 15–44 by the national rate to estimate the age-distribution effect of the potentially fertile women on fertility. The dividend was then multiplied by the unstandardized CWR to obtain the standardized CWR. To obtain the standardized 1960 CWRs, we followed the identical procedure except that we used the five-year age-specific CWRs for nonwhite women aged 15–49, as reported in the U.S. Bureau of the Census (1963: I-485), for the standardization. In general, the standardized CWRs were higher than the unstandardized ones in rural counties, whereas the opposite was true in urban counties. These differentials reflect the migration of highly fertile young adults from rural to urban areas.

FIGURE 7. Child-woman ratios, by county, standardized on U.S. black population: six-state region, 1940


Less than 300
300–499
500–699
700 and above
Fewer than 400 blacks in county
0
200
Miles

SOURCES: U.S. Bureau of the Census (1943b, 1943c, 1945).

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less than, 2.5 years. To be counted, most children therefore must have survived the high risks of mortality in the year immediately following birth and the most dangerous months in the period defined as "toddler mortality" (1–4 years). The CWR is therefore affected by differential mortality in a way that fertility data derived from registered births should not be. It is also likely to be affected in this instance by differential undercounting of children under age five and of women in the reproductive age range. (Such differential undercounting also affects the estimated TFR.) Implicit in the measure, when it is used to estimate fertility, is the notion that children live with their mothers (or at least, in this case, stay in the same county). We assume in this study that errors arising from the estimation method are spatially random.

The difficulties posed by the inadequate fertility data notwithstanding, the correlation between the two data sets, the 1940 estimated total fertility rates and the child-woman ratios derived from the 1940 census, was +.82 for the counties of the six states. This is a moderately high score, providing some assurance that the overall patterns remain valid. For instance, Table 4 shows that both the TFRs and the CWRs correlate well with the broad groupings of estimated syphilis rates.

The data on which the TFRs are based, the age-specific fertility rates, are also of interest, as they illustrate the progressive effect of venereal diseases on fertility with increasing age. In Table 5 data from

TABLE 4. **Average child-woman ratios and total fertility rates for blacks in counties with estimated syphilis rates ranging from less than 10 percent to over 50 percent: six-state region, 1940**

Estimated syphilis rates among blacks (%)	No. of counties	Average CWR	Average TFR
<10	24	609.6	4.206
10.0–19.9	106	571.2	4.158
20.0–29.9	155	523.8	3.825
30.0–39.9	96	446.9	3.412
40.0–49.9	32	370.9	2.676
50 >	30	300.2	2.280
All counties	443	496.9	3.648

SOURCE: All estimates our own.

TABLE 5. Age-specific birth rates (ASFRs), total fertility rates, and child-woman ratios for blacks in counties in which the estimated syphilis incidence was under 20 percent and over 40 percent: six-state region, 1940

Age group	ASFRs for counties with specified syphilis rates among blacks: 20% (1)	40% (2)	Ratio 2 to 1 (%)
15–19	134.6	132.4	98.4
20–24	219.5	131.6	60.0
25–29	186.6	98.8	52.9
30–34	148.0	71.7	48.4
35–39	100.8	43.2	42.9
40–44	38.1	17.4	45.7
45–59	5.9	1.8	30.5
TFR	4.167	2.484	59.6
CWR	578.3	336.8	58.2

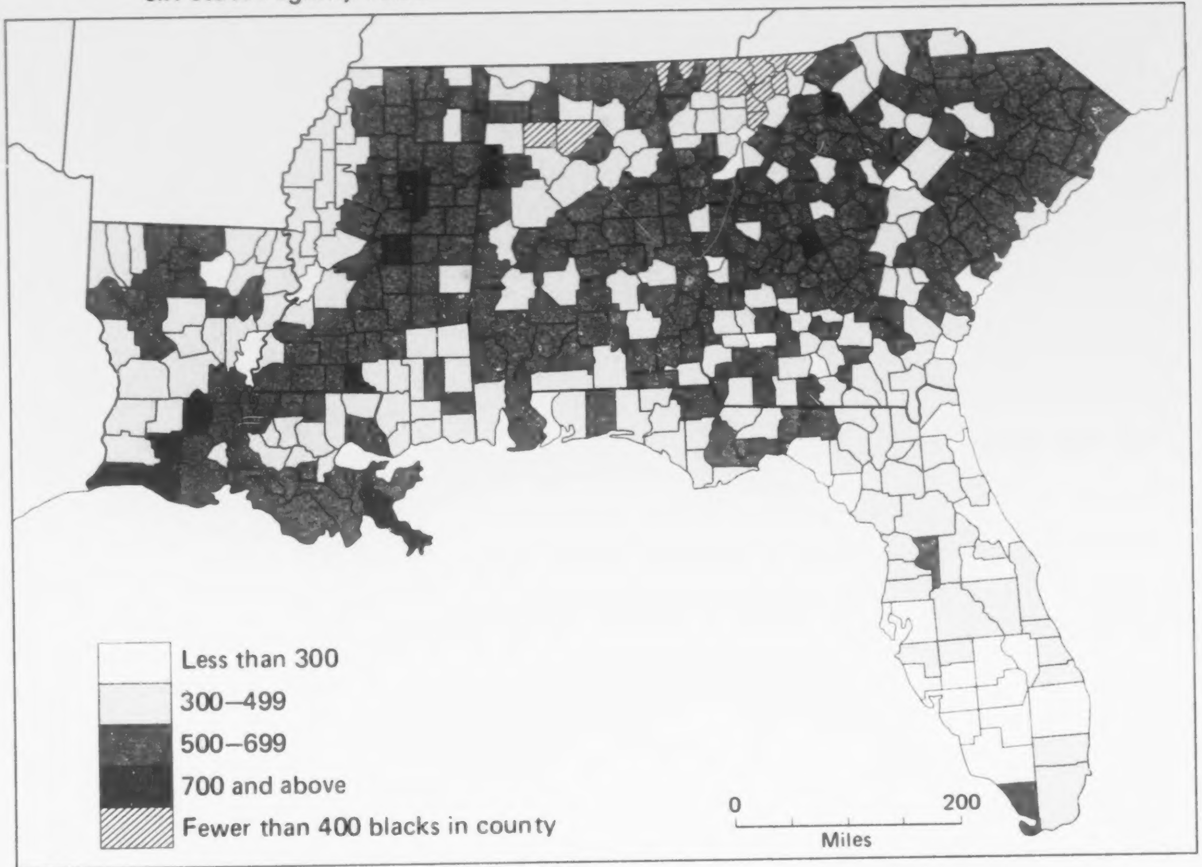
SOURCE: All estimates our own.

the counties showing extreme characteristics, less than 20 percent syphilis incidence and over 40 percent incidence, are used. For the youngest fertile age group, the birth rates are approximately equal in both cases, but in the counties with hyperendemic disease, the effect of the disease on fertility levels becomes more pronounced with higher age. The most rapid falloff occurs at ages under 30, reflecting the fact that both gonorrhea and syphilis are most likely to be first contracted in the teens or early 20s, and to have their greatest effect early in the reproductive years.

The pattern in 1930

The situation described above must have built up over a considerable period, but the possibility of analyzing past trends on a detailed areal basis is limited to the year 1930. The pattern of child-woman ratios for that year (Figure 8), compared with those of 1940 (Figure 7) shows a less extreme situation in that there are fewer counties in the lower fertility classes. For example, in 1930 there were 27 counties with a CWR of less than 300 per thousand, but by 1940 the number had risen to 34. The concentrations were similar, with areas of low

FIGURE 8. Child-woman ratios, by county, standardized on U.S. black population: six-state region, 1930


Less than 300
300–499
500–699
700 and above
Fewer than 400 blacks in county
0
200
Miles

SOURCE: U.S. Bureau of the Census (1943c)

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fertility again appearing in Peninsular Florida (one rural county had a CWR of only 140) and the Delta region of Mississippi and Louisiana, where most counties showed a 300–350 range. The Atlantic Tidewater region and the Gulf Coast also show up as having fairly low fertility.

Many of the counties containing the larger urban areas appear as having very low fertility. Atlanta, Savannah, Augusta, Jacksonville, Tampa, Pensacola, Vicksburg, and Monroe fall into this class, with CWRs of less than 300 in both 1930 and 1940. But several other urban areas show ratios in the 300–399 class in 1930; among these are Miami, Mobile, Birmingham, Biloxi, Natchez, and Baton Rouge. Most counties showed a higher CWR in 1930 than in 1940. Exceptions were several counties in the Mississippi Delta that registered increases of about 100 between 1930 and 1940, possibly related to pellagra control. Areas of relatively high fertility in 1940–eastern South Carolina, Southern Louisiana, and central and northern Mississippi–appear to have had even more noticeable high fertility in 1930.

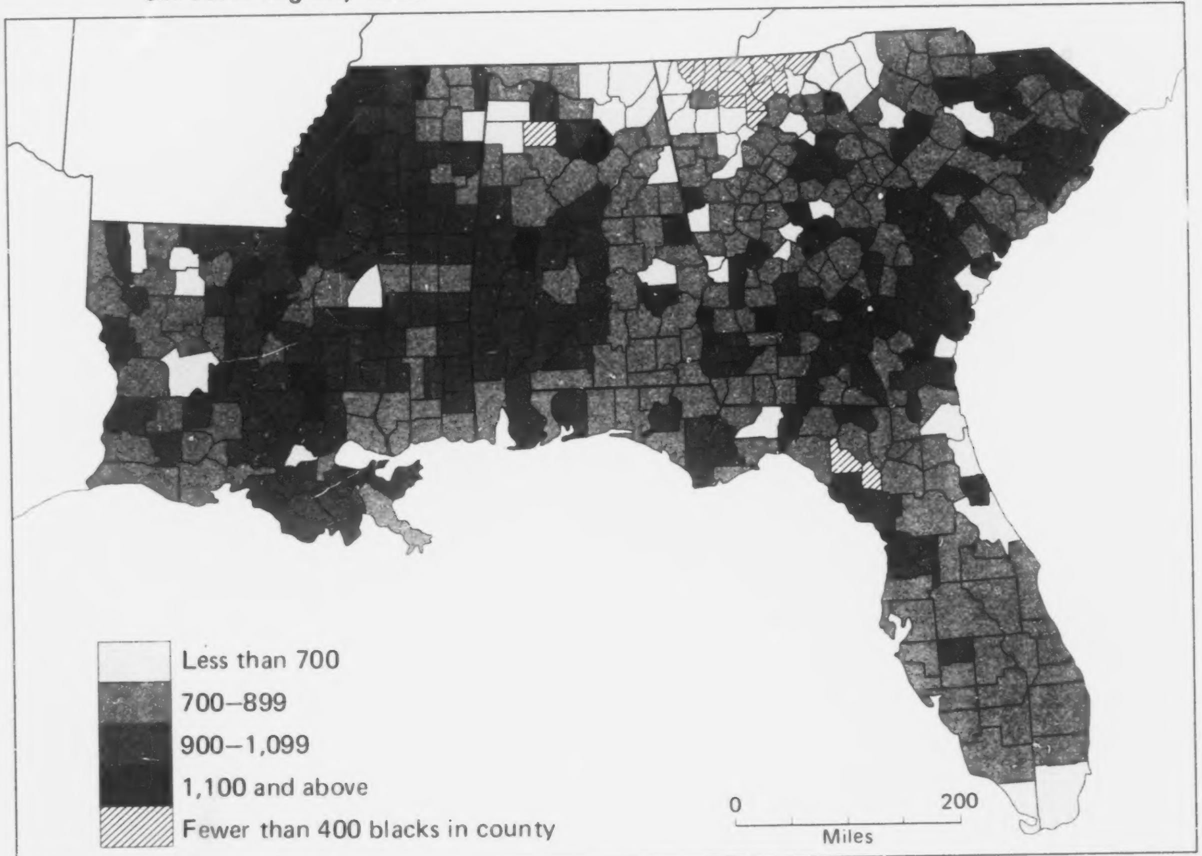
The 1930 and 1940 CWR distributions thus indicate a fertility decline among blacks throughout most of the region. The decline cannot have been the product of a recent development but must have grown out of a trend lasting at least several decades before 1930. Venereal disease would seem to be the primary cause of the trend.

The transformation of fertility levels: 1940–60

Use of child-woman ratios allows direct comparison to be made between the pre-World War II distributions and those of the postwar era. The distribution of CWRs for 1960 (Figure 9) reveals black fertility at its postwar maximum, providing a sharp contrast to the two prewar distributions. The transformation of black fertility in the years after the war is truly remarkable. In the six-state area as a whole the CWR increased by more than 60 percent between 1940 and 1960. When Figures 7 and 9 are compared, it is apparent that the CWR increased substantially in almost every county.

Figure 10 shows the magnitude of the changes. The Mississippi Delta region, the outstanding case, showed an increased CWR of more than 600 in almost every county. In several other areas increases were less but still substantial. In Peninsular Florida increased CWRs varied between 400 and 650, in southwestern Alabama increases were 400 to 500, while in the counties containing urban areas of more than

FIGURE 9. Child-woman ratios, by county, standardized on U.S. black population: six-state region, 1960


Less than 700
700–899
900–1,099
1,100 and above
▨ Fewer than 400 blacks in county
0
200
Miles

SOURCE: U.S. Bureau of the Census (1963).

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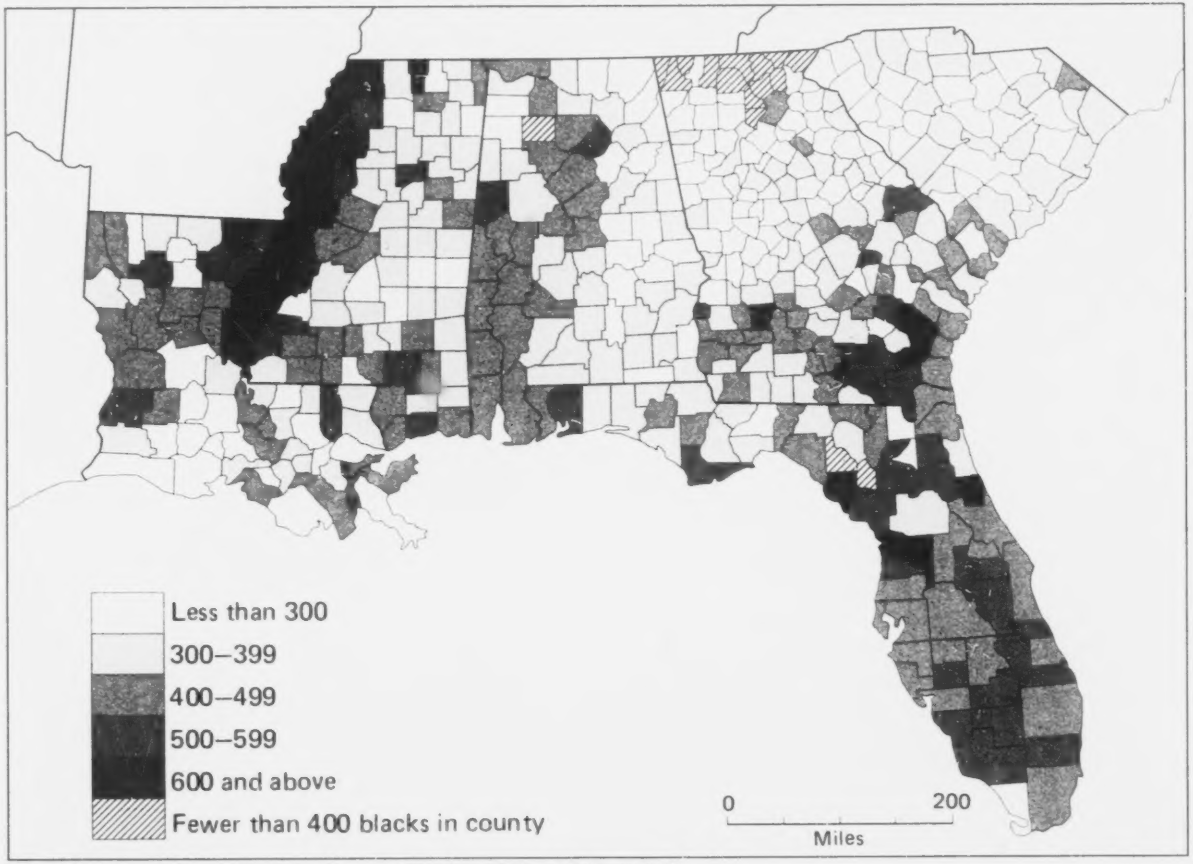
FIGURE 10. Changes in child-woman ratios between 1940 and 1960: six-state region


Less than 300
300–399
400–499
500–599
600 and above
Fewer than 400 blacks in county
0
200
Miles

SOURCES: U.S. Bureau of the Census (1943b, 1943c, 1945, 1963).

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100,000 increases of 400–500 were usual. The least change (CWRs around 200) occurred in a wide swath including all of South Carolina and extending through central Georgia and eastern Alabama. Only in one county (Cameron County, Louisiana) did the CWR decline. This county had the second highest CWR in all six states in 1930 and 1940, but a decline of 6 percent between 1940 and 1960 placed it in a moderately low fertility category in the latter year.

Although a small part of the overall increase in child-woman ratios among blacks was due to reduced child mortality and improved enumeration of children, the amount, swiftness, and variability of the increase in these six southern states can be adequately explained only by the sudden and dramatic decline of sexually transmitted diseases, the major cause of blacks' previously depressed fertility. The transformation was a consequence of the introduction of the first really efficient means of treating the diseases, beginning with sulfa drugs in the middle 1930s and culminating in the widespread adoption of true antibiotics, starting with penicillin in 1944.

Confirmation of this process lies, to a degree obvious in the differential distribution of fertility in 1960, in the beginning of a true demographic transition among the blacks of the region. By 1960, high fertility among blacks had assumed a direct relationship with poverty, a relationship that was particularly apparent in the Mississippi Delta region but extended into much of the "deepest South"–Mississippi, Alabama, and southern Georgia. By contrast, Florida, the most prosperous state, showed fertility below the average for the region; and the most industrialized part of the South, the Piedmont region, also exhibited lower than average fertility. Most of the larger urban areas had below-average fertility in 1960, although, in contrast to 1940, they did not generally represent islands of low fertility. In Peninsular Florida, the black TFR stood at 4.8, which (although below the six-state average of 5.1) was double that of 1940, when Florida was a classic example of involuntary depressed fertility. We believe that this emerging pattern of differential fertility was affected to a large extent by variation in deliberate fertility control.

IMPACT OF VENEREAL DISEASES ON BLACK FERTILITY

In the previous sections we have established the geographical linkages between fertility and the incidence of venereal diseases. It remains now to assess the quantitative effect of syphilis and gonorrhea on black fertility. Perhaps the main virtue of the paper "Impact of VD on the Fertility of the U.S. Black Population, 1880–1950" by McFalls (1973) is the attempt to do this. In his conclusion McFalls states that, even under his "unrealistic" assumptions, which overstate the physiological impact of the venereal diseases, the spread of syphilis and gonorrhea through the black population after Emancipation could not have accounted for more than one-fifth of the decline in the TFR from 7 in 1880 to 3 in 1936.

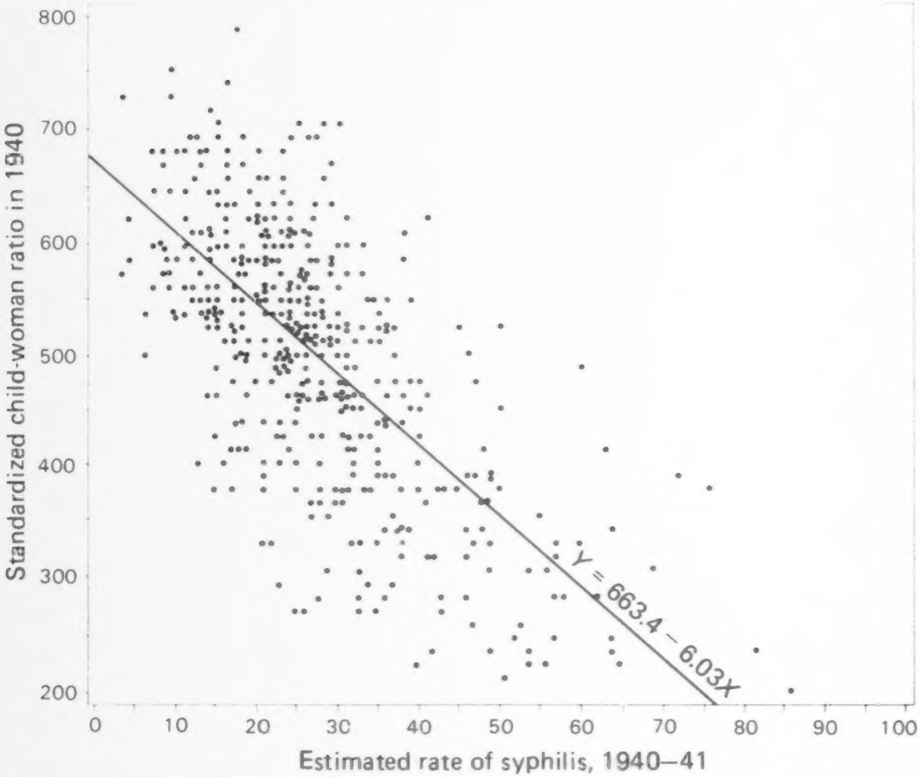
To arrive at this estimate McFalls, building a model relating the incidence of syphilis and gonorrhea to their likely effect on the number of births, utilizes incidence levels and indices that are debatable. For instance, he accepts a 25 percent level for the average incidence of syphilis in the black population in the late 1930s; but data drawn from the results of the seriologic testing done on World War II recruits suggest that the levels of infection, among age groups well within the reproductive span, rose to 35 percent, and it may be justifiable to substitute this higher level. McFalls concludes that syphilis could account directly for no more than 5 percent of the fertility decline. We see this estimate as extremely conservative. In the case of gonorrhea McFalls denies that the disease was as prevalent as his evidence and ours suggest. He dismisses a prevalence figure three times greater than for syphilis as "most improbable," without saying why, and uses instead a multiple of two, reckoning that 20 percent of those affected became sterile. It is fairly well established that gonorrhea cases were occurring four times more frequently than syphilis, and we have noted some instances of up to eight. McFalls ascribes only 12 percent of the fertility decline to gonorrhea among black females and only 4 percent of the decline to gonorrhea among males (McFalls, 1973: 16–18). He concludes: "But if VD was not the major architect of black fertility, how can the trend be explained? This is still an open question mainly because the required evidence has not yet materialized" (McFalls, 1973: 18). Since writing that conclusion, McFalls has attempted to supplement the evidence supporting some of the other likely causes (McFalls, 1979, 1981; McFalls and Masnick, 1981).

After reviewing McFalls's model and experimenting with some of our own, we came to reject his approach as being too dependent on data that are deficient, tenuous, and, in some important instances, just not available. Consequently, any assumptions based on them are bound to be "unrealistic" and to become the focus of fruitless argument. The variables used are too prone to judicious selection on the basis of one's expectations or ideology.

We believe that the possibility of substantiating the role of the traditional explanations for the decline in black fertility, which McFalls expects to account for the other four-fifths of the fertility decline, is remote. The effects of family planning, changes in marital conditions, and health problems other than the venereal diseases do not seem to be of a force to induce a decline of the magnitude observed in the decades after Emancipation. To derive a more objective indication of the effect of venereal diseases on black fertility in 1940–41, using the six chosen states as the extreme example, we have run a linear regression relating the child-woman ratio for each county to the estimated rate of syphilis occurrence (Figure 11). Implicit in this model are the following assumptions:

1. That rates of syphilis and gonorrhea are highly correlated. This assumption seems safe enough, based on the evidence reviewed, for counties with large populations, though it is subject to considerable random error where county populations are small.
2. That there is a linear relationship between syphilis rates and fertility—that is, that twice the number of cases of syphilis should have twice the impact on fertility.
3. That indicated syphilis rates can be used as a proxy for gonorrhea rates in the absence of comparable spatial data on gonorrhea. However, the ratio of gonorrhea to syphilis infections, where effective medical control is lacking, cannot be exactly linear because one syphilis infection confers immunity against subsequent fresh attacks, whereas one gonorrhea infection confers no such immunity. Even the potential effect of each gonorrhea attack cannot be the same since the crucial effect, total infecundity, can be achieved only once, and subsequent attacks would have no further effect. Overall, the result of equating the effects of syphilis and gonorrhea on fertility will be to underpredict fertility in areas characterized by low syphilis rates and to overpredict fertility somewhat where syphilis is hyperendemic.
4. That persons examined by the Selective Service boards were representative of the male population of reproductive age as a whole. As nearly all males of draft age during World War II were examined, this assumption should be generally correct for the period 1940–45, but it may not be valid for groups examined in some areas during the period covered by the data available (November 1940 through September 1941).
5. That the age structure of persons examined was similar in all counties. We have no data to verify this assumption, and undoubtedly there would

FIGURE 11. Relationship between estimated incidence of syphilis in 1940–41 and standardized child-woman ratios in 1940, by county: six-state region



SOURCES: U.S. Bureau of the Census (1943b, 1943c, 1945); U.S. Public Health Service (1942); Gill, Smith, and Damon (1943); Sonday (1944).

> have been variation among the counties. The variation could be of importance, since syphilis is more prevalent in the age groups under age 40 than in older age groups.

To the extent that our data do not accord with these assumptions, one would expect the inverse correlation between the two venereal diseases and fertility to be reduced. Problems related to our two imperfect data sets, already discussed, would also weaken the hypothesized correlation.

The correlation between the CWR and the estimated incidence of syphilis, by county, for the six-state region is –.69 in 1940–41. Excluding Alabama, which had improbably low syphilis rates, the correlation is −.71. The coefficient of the determination is .48, which suggests that approximately half of the fertility variation found in the counties is attributable to variation in the incidence of syphilis. All problems considered, we see the correlation of .69 to be quite high, and strong support for our hypothesis.

In this analysis, the constant in the regression equation, which indicates what the CWR should be in the absence of syphilis, is of as much interest as the correlation. We are also interested in the slope (*B* value), as it will tell us how much the CWR changes with each percentage increase in the syphilis rate. The possible errors mentioned earlier should not affect either the constant or the *B* value, provided the errors occur in a random manner.

The actual generated linear equation is $CWR = 663.4 - 6.03X$, or $681.7 - 6.42X$ if Alabama is excluded. Therefore, the CWR in this black population, if there were no syphilis, would be 663, and each percentage of increase in the incidence of syphilis would reduce the CWR by about 6. Were syphilis universal, the CWR should be about 60.

Although the CWR of 663, after we allow for high infant mortality levels in 1940, is quite substantial (in fact only 12 of the 484 counties in the study region showed higher levels than this), it is nevertheless an indication that forces other than the venereal diseases were at work in lowering black fertility.

Assuming that the CWR would have been 663 in the absence of venereal diseases, we can estimate the proportion of the total post-Civil War fertility decline that is attributable to the spread of venereal diseases. In making this estimate we convert the CWRs of the national black population in 1880 and 1940 and the predicted CWR of the 1940 "syphilis-free" black population into general fertility rates (GFR)–i.e., number of births per year per 1,000 women of ages 15–44 years.

For this purpose child-woman ratios must first be adjusted for enumeration errors among children under five and women 15–44. If mortality that has previously occurred to the 0–4 cohort is added, we get a reasonable estimate of the number of children born in the preceding five years. Dividing this estimate by the number of women 15–44, dividing the quotient by five, and then multiplying the result by 1,000 give an estimate of the general fertility rate in the preceding five years. Not all women 15–44 at the time of the census were in that age group during the entire five-year period, but this is not a serious practical problem. The resulting estimate of the general fertility rate is fairly accurate if the estimate of births in the preceding five years and the number of women 15–44 at census time are accurate.

To estimate what child-woman ratios would have been indicated by accurate census data, we used 1880 and 1940 national black populations reconstructed by Coale and Rives (1973). For estimating mortality in the 0–4 cohort for 1880, we utilized Eblen's estimated life expectancies at birth of 33.0 and 34.3, respectively, for black males and females between 1870 and 1880 (Eblen, 1974: 307–8). The proportion of persons born who survived to be counted in the 0–4 cohort of 1880 was then estimated from model "West" life tables (United Nations, Department of Economic and Social Affairs, 1967). In estimating 1935–39 infant and child mortality, we used Coale and Rives's estimated life expectancy in 1930–39 and 1940–49 (e_0) of 46.1 and 54.0, respectively, for females and 43.1 and 50.6, respectively, for males. We conservatively estimated that between 1935 and 1940 male and female life expectancies at birth were 47 and 50 years, respectively. Again, we estimated the past mortality occurring to the 0–4 cohort of 1940 from "West" model life tables.

According to the reconstructed population of Coale and Rives, the CWR of the 1940 black population was understated by 10.5 percent (computed from Coale and Rives, 1973: 21). In addition, we estimate that the 0–4 black cohort of 1940 was reduced by about 15 percent through infant and child mortality. If both assumptions are correct, in 1940 the CWR would have been 872 in the absence of venereal diseases, undercounting, and infant and child mortality. This ratio in turn suggests a general fertility rate of 174.2 during the preceding five years. In 1880, the highest CWR on record, 759, was noted. According to the Coale and Rives reconstructed population, however, the true CWR was 849. Assuming that the 0–4 cohort was reduced by 27 percent from mortality, as the Coale and Rives estimates imply, the CWR in the absence of infant and child mortality would have been 1,180. This ratio suggests an average GFR of 236 for the preceding five years.

On the basis of these calculations we estimate that the national black GFR was 236.0 during 1875–80 and 96.7 during 1935–40. The estimated 1935–40 GFR in the "syphilis-free" black population was

174.3. Assuming an effect of zero or close thereto from venereal diseases immediately after the Civil War, one calculates that the GFR by this estimate declined 61.7 points even in the absence of a venereal-disease effect, whereas it actually declined by 139.3 points. This result suggests that 56 percent of the total decline was attributable to the spread of venereal diseases. Since a characteristic of our estimate is to underpredict fertility in areas with low rates of syphilis, this estimate may be regarded as conservative.

A regression run on the relationship of the estimated prevalence of syphilis in 1940 with the 1960 standardized CWRs by county yielded a correlation of −.22. That the coefficient of determination is only .049 shows that less than 5 percent of the variation in the 1960 CWR can be explained by areal variations in the effect of syphilis. This very weak relationship is not surprising, as the impact of venereal diseases on black fertility in the postantibiotic 1950s would have been greatly reduced.

The correlation between the estimated rate of syphilis in 1940 and the 1940–60 percentage changes in the CWRs by county (Figure 12) is .68; 47 percent of the variation in change can be attributed to the estimated rate of syphilis. This result provides further confirmation that 1940 areal variations in fertility resulted largely from variations in the incidence of venereal diseases. The regression equation "predicts" the average increase in a county free from syphilis in 1940 to be 22 percent. Because of improved enumeration of children and a lower mortality rate in 1960, the national black CWR would have increased by 19 percent had there been no change in the level of black fertility.[4] Also "predicted" by the regression equation is that, in the average county in which the estimated rate of syphilis was 33 percent in 1940, the CWR would double between 1940 and 1960.

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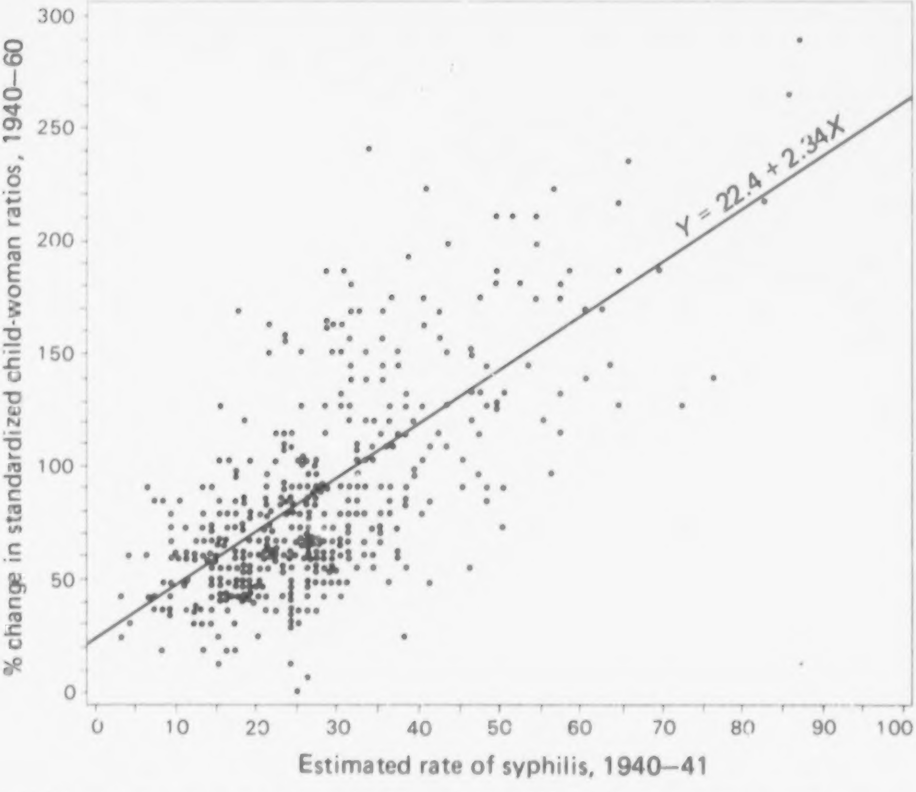
[4] According to the Coale and Rives reconstructed black population of 1960, the child-woman ratio was understated by only 0.8 percent in the national census. If one assumes the life expectancies given in Coale and Rives (1973), mortality reduced the 0–4 cohort by 8.5 percent. Under these circumstances, a 1960 CWR of 439 shows equivalent fertility with the observed 1940 CWR of 368. The actual observed CWR in 1960 was 694. By using the adjustment procedures already described, we derived an estimated general fertility rate of 153.0 for the five years preceding the 1960 census. This GFR is 58 percent higher than the estimate derived for the five years preceding the 1940 census.

FIGURE 12. Relationship between estimated incidence of syphilis in 1910–11 and the percentage change in standardized child-woman ratios between 1940 and 1960, by county: six-state region



SOURCES: U.S. Bureau of the Census (1943b, 1943c, 1945, 1963); U.S. Public Health Service (1942); Gill, Smith, and Damon (1943); Sonday (1944).

COUNTERING THE THREE OBJECTIONS

The evidence assembled and reviewed here shows a fertility decline that is dramatic, cumulative, and obviously related to some powerful external factor or factors that worked with gathering intensity over the period. There is apparently a strong causal relationship between increasing levels of venereal disease and decline in black fertility, specifically in the six southeastern states, but also by implication among the U.S. black population as a whole. We have demonstrated that more than half, 56 percent as a conservative estimate, of this decline can be ascribed to the effect of venereal disease-induced involuntary infecundity.

The fertility decline did have other contributary causes, including other medical causes such as pellagra (Farley, 1970), tuberculosis (McFalls, 1981), and malaria, as well as deliberate pregnancy avoidance, abortion, and changing marital patterns. Nevertheless, none of those factors has been shown to have the power to alter fertility levels that we attribute to the sexually transmitted diseases. To have caused the decline of the magnitude recorded, the factors, whatever they were, could scarcely have escaped notice in the literature on black social history. But none of the alternative causes, certainly not "birth control," is conspicuous in the literature.

This is also true of the venereal diseases, at least before the 1930s. They are a special case, given the hush they induced in most circles, their slow and insidious effects on fertility, and the lack of knowledge of that effect at the time. During the 1930s, by which time the impact was massive, it is possible to find a considerable amount of empirical material linking subfecundity, sterility, and pregnancy wastage with the prevalence of venereal disease among blacks. But it was not until studies of the peculiarities of black fecundity were made (e.g., by Grabill, Kiser, and Whelpton, 1958: 217; Farley, 1970: 222–26) that the causal hypothesis gained currency.

As agents of significant demographic alteration, the venereal diseases have had some difficulty in being recognized. Originally they were merely overlooked, but recently some overt skepticism of the venereal-disease hypothesis has surfaced. For instance, McFalls has been at pains to downplay, if not to dismiss, the possible effects in the case of the U.S. blacks (McFalls, 1973 and 1979; McFalls and Masnick, 1981).

> The conclusion that few blacks practiced birth control from 1880 to 1940 led many demographers to conclude that the fertility decline in this period was due almost entirely to changes in health factors prejudicial to fecundity, particularly venereal diseases. A health hypothesis was developed which stipulates, in part, that the prevalence of these health conditions increased among blacks from 1880 to 1940, thereby severely reducing their fecundity and subsequent fertility and leading to widespread involuntary childlessness, especially in urban areas. The health hypothesis, as the first available explanation of the black fertility trend, was widely accepted. This adherence to what recent critiques have shown to be a faulty hypothesis

> only served to stymy the development of a more comprehensive and accurate view of the fertility trend. Thus, the importance of such factors as birth control was overlooked for many years (McFalls and Masnick, 1981: 90).

McFalls (1973) has invoked various objections to the "health hypothesis." Some have been discussed previously and others are not strong enough to merit discussion. Three of his objections do require further investigation.

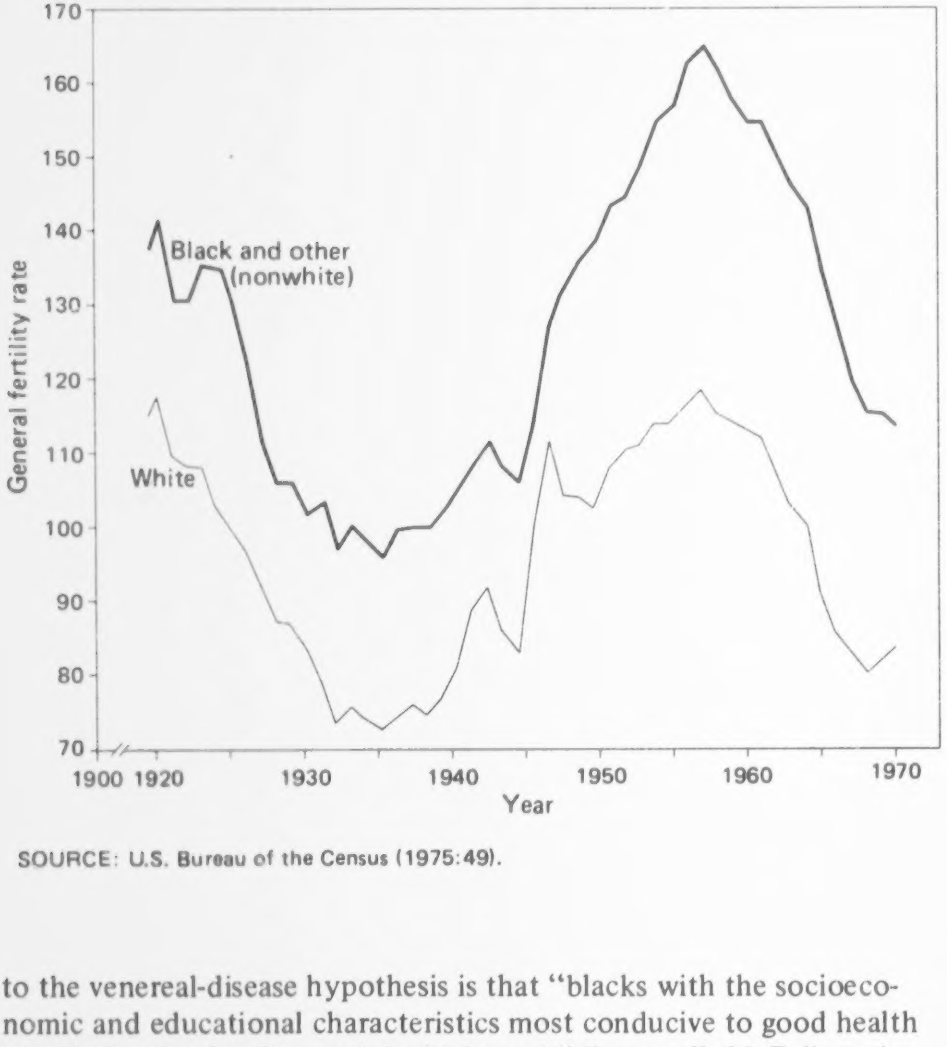
The first objection involves the timing of the turnaround in black fertility decline, which occurred before effective antibiotic treatment for either venereal syphilis or gonorrhea became available and before black communities were much affected by treatment or intervention of any kind. That syphilis and gonorrhea showed signs of some recession in the late 1930s prior to the widespread application of antibiotics has been established (see Figure 2). It is not possible to be certain about the year in which this occurred; nor was the quality of registration of black births sufficiently good to be certain of the year when black fertility reached its lowest point. It is possible to establish that the black fertility decline was reversed and the venereal-disease recession occurred at times not sufficiently different to invalidate the causal relationship suggested.

Black fertility showed a rapid decline, of about 3.0 percent annually, between 1920 and 1930, after which it declined at a slower rate over the next six years to reach its lowest level at an average fall of less than 1.5 percent annually. Between 1936 and 1945 black fertility began to increase, but very slowly, not suddenly as McFalls suggests (1973: 12). The average rate of increase was less than 1.0 percent per year. After 1945, the rate became consistent and dramatic, with a mean of 4.2 percent annually until fertility peaked about 1956 (Figure 13).

The relative contributions of the various forces likely to have been involved in the deceleration and the bottoming out of the eight-decade-long fertility decline in the 1930s and early 1940s cannot yet be specified. But the path of change is consistent with known changes in the incidence of syphilis and gonorrhea, while the extremely forceful increase in fertility between 1945 and 1957 is difficult to explain unless one invokes a rapid reduction in fecundity-reducing physiological conditions related to the progressive dissemination of antibiotic treatment among blacks, particularly those of the rural south.

The second "~~glaring~~ inconsistency" raised by McFalls in objection

FIGURE 13. General fertility rates of white and black U.S. populations: 1920–70



SOURCE: U.S. Bureau of the Census (1975:49).

to the venereal-disease hypothesis is that "blacks with the socioeconomic and educational characteristics most conducive to good health had the lowest fertility and the highest childlessness" (McFalls and Masnick, 1981: 90). Not stated is that this higher socioeconomic and educational group resided principally in cities in the northern states where, as a small migrant minority (rising from 8 percent of all U.S. blacks in 1900, or fewer than 1 million persons, to 21 percent in 1940), their demographic characteristics diverged from those of the parent population remaining in the still predominantly rural south.

Even in 1940, at the end of the fertility decline, 51 percent of all

U.S. blacks lived in the rural south (ca. 6.6 million). During the first decades of the decline the proportion exceeded 80 percent. The northern, largely urban, blacks showed syphilis rates in 1941 lower than those typical of the rural and urban rates in the six-state study area, which averaged 276 per thousand for rural and 386 per thousand for urban blacks. This difference would indicate that their life-styles and access to medical care contrasted with those of their southern counterparts. Urban blacks had syphilis rates of 196 in New York State, 192 in Pennsylvania, and 217 in Illinois. Social discrimination and high joblessness notwithstanding, northern urban blacks are likely to have absorbed something of the middle-class aspirations of their white neighbors. For those same reasons, their lower fertility and greater childlessness may have been related to a conscious and deliberate desire to avoid pregnancy, particularly during the adverse economic conditions of the 1930s. This hypothesis accords well with the findings of Pearl (1937: 1387) that in New York City and Chicago, for instance, significant proportions of black women acknowledged using contraception. The diffusion among U.S. blacks of the notion of deliberate control over fertility, a trend that after 1960 came to determine their fertility levels, must have started somewhere. The large northern cities seem the most likely hearth; the rural counties of the still impoverished south, the least likely.

Among southern blacks examined by draft boards in World War II, syphilis rates were lowest among farm operators. They were much higher for all other occupations, including other rural occupations, such as farm laborers, and in urban occupations including professionals (Usilton, P. Bruyere, and M. Bruyere, 1945: 215–20).[5]

Venereal diseases appeared to have been widespread among blacks of all social classes in southern cities at the end of the fertility decline. Serologic testing of 90 percent of the adult black population of Savannah, Georgia, in 1945 revealed relatively narrow differentials by occupation and educational achievement, particularly among males. For example, although the incidence was highest for males in less skilled occupations (laborers, 454 per thousand; operative and kindred workers, 451 per thousand) and fewer years of schooling (those with less than 12 years schooling, over 400 per thousand), it was also very high for the better educated and for males in occupations requiring greater skills. Professional males over 30 years of age and "proprietors, managers, and officials" showed rates of 364 and 393 per thousand, respectively (Bowdoin et al., 1949: 135). Not surprisingly, given these levels, the county in which Savannah is located was consistently mapped in the least fertile category, but it was not exceptional among the heavily urban counties of the South (Figures 6, 7, and 8). The proportion of blacks with more than 12 years of schooling and in occupations suggesting better socioeconomic conditions was still quite low, scarcely 5 percent in the Savannah sample, and this group would have had little effect on the characteristics of the black population as a whole.

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[5] These differences cannot be quantified here with precision because Usilton et al. present the rates by age in graph form and the graphs are poorly organized.

As we note earlier, fertility among rural blacks tended to be higher in counties with larger proportions owning their own farms and lower where blacks were mostly agricultural laborers. Unfortunately, no distinction is made between farm owners and farm tenants in the children-ever-born data collected by the U.S. Bureau of the Census. However, farm operators are distinguished from farm laborers. Wives of black operators and laborers in the 1835–39 birth cohort both reported an average of 7.0 children ever born and a 5 percent childlessness rate (U.S. Bureau of the Census, 1945: 27). These levels, achieved before the fertility decline got under way, are consistent with the levels associated with relatively unrestricted fertility and normal involuntary childlessness that we take to be characteristic of the pre-Emancipation period. Table 6 shows childbearing patterns among wives of farm operators and farm laborers, both white and black, whose childbearing periods were principally during the fertility decline (cohort 1905–09) and during the post-World War II recovery (cohort 1930–34). In the earlier period, black farm laborers' wives showed the highest childlessness levels and a completed family size of 1.5 fewer children than the black farm operators' wives. By 1970, among laborers born between 1930 and 1934, childlessness occurred at normal levels and laborers' average family size had increased to over six children, exceeding that of the operators by 0.5 children. By contrast, the family sizes of whites of both groups scarcely changed and that of the black operators rose only slightly.

Several studies conducted prior to World War II provide supporting evidence that the fertility of black farm-owning families was substantially higher than that of farm-tenant families. In a study undertaken

TABLE 6. Childlessness and average number of children ever born to wives of farm operators and farm laborers in the censuses of 1950 and 1970: United States

Birth cohort, age group, race, and husband's occupation	Percentage childless	Average number of children ever born
1905–09, ages 45–49		
Black		
Farm operator	13.8	5.3
Farm laborer	22.3	3.8
White		
Farm operator	12.8	3.5
Farm laborer	12.8	4.2
1930–34, ages 35–39		
Black		
Farm operator	2.7	5.9
Farm laborer	4.4	6.4
White		
Farm operator	4.6	3.6
Farm laborer	5.3	4.2

SOURCES: U.S. Bureau of the Census (1955: 90–96; 1973: 206, 215).

in the Mississippi Delta, Hitt (1942: 408) showed that, whereas 35 percent of blacks living on black-owned farms were under age 15, the comparable proportion in sharecropping families was only 28 percent. Another study (Raper, 1936: 76) indicated that, whereas the mean numbers of children ever born to black women past childbearing ages in Green and Macon counties, in the Black Belt area of Georgia, were 5.9 and 6.6, respectively, the equivalent numbers among women of sharecropping families were 4.9 and 5.3. These findings are consistent with the relationship between fertility and farm ownership suggested by the 1930 and 1940 patterns of areal fertility in the six-state area of our study. As expected, the Rosenwald serologic surveys (Clark, 1932) also showed rates of syphilis to be much higher among sharecropping than in farm-owning families. Agricultural laborers were not present in large numbers in any of the counties tested, so that no inferences can be made concerning them from the Rosenwald surveys. However, the World War II evidence from the Peninsular Florida counties is that rates of syphilis were very high among agricultural laborers.

There is reassuring evidence that the negative relationship between venereal disease and fertility is not merely an artifact of the disease being concentrated in urban areas. If it were, one could argue that fertility would have been much lower even in the absence of venereal disease, as seems to have been partly the case in northern urban areas. The correlation between the estimated rate of syphilis in 1940 and the 1940 CWR in the 183 completely rural counties was −.70. For counties in which more than half of blacks were urban-dwelling, the equivalent correlation was −.64. In those more urban counties the predicted CWR in the absence of syphilis was only moderately lower than in the rural counties (<100 points) in 1940, suggesting that even though urban mores promoting lower fertility were working in the South, their effect prior to U.S. entry into World War II was minor.

McFalls's (1973: 18) final objection to the disease hypothesis is related to the fertility trends of both whites and blacks. These trends are so similar that McFalls contends both populations must be responding to similar stimuli. This hypothesis does not survive detailed examination. The behavior of the GFRs after 1936 shows some revealing divergencies (Figure 13). For both groups the slow increase in fertility, after the nadir of 1936, was interrupted after 1943 by a drop in births related obviously to family disruption caused by servicemen's entry into World War II. Between 1945 and 1947 a dramatic recovery occurred. For whites this postwar phenomenon was, again obviously, caused by war-parted couples making up for lost time. From 1947 to 1950 there was a slight decline in white fertility, followed by the true postwar baby boom. This new force was probably related to the long-term increase in fertility that began in the late 1930s, and it was spurred by optimism and prosperity throughout the 1950s. For blacks the trend was somewhat different. The disruption in the numbers of births occurred, on a somewhat lesser scale than for whites, during the absence of servicemen from their homes, which was followed by a rapid recovery after 1945. Instead of dropping temporarily after 1947, as did white fertility, the black trend continued to rise spectacularly to a peak in 1957, after which, again like the white, it began a similarly spectacular slide.

From the levels observed just before the effect of World War II absences occurred, white fertility rose 28 percent to its peak in 1957;

at the same time black fertility rose over 47 percent to levels not seen since 1910. We regard this as a partial return to traditional levels of fertility, the aspirations for which had never evaporated. By this time however, those aspirations had certainly been modified, particularly among the better educated middle-class blacks and in the north, where most blacks lived in urban areas engaged principally in nonfarm occupations. But the levels of black fertility at this time were still not determined by northern-dwelling, middle-class, urban blacks. Instead, the lowered fecundity of southern black women–the wives (and lovers) of sharecroppers, tenant farmers, and rural and urban laborers–was still the overriding factor.

The conclusion that the black fertility trend was fashioned by the same "traditional factors" that operated among whites is not credible. It implies that black women were willing to absorb attitudes toward fertility control from their spatially proximate white neighbors while rejecting (until about 1910) or heavily filtering (for several decades thereafter) aspirations for improved mortality control from the same source. Had significant mortality decline among blacks paced that among whites–that is, had their life expectancy shown a steady increase beginning well before Emancipation–this stance would be more defensible. Instead, black mortality showed almost no signs of improvement until after 1910 when, with an e_0 of about 32 years, it was more than 35 percent below the white level.

The causes for this discrepancy lie in fundamental differences between the two peoples, culturally, historically, geographically, economically, politically, and demographically. To accept the theory that blacks in the U.S. during the century following Emancipation were motivated to progressively reduce their fertility by deliberate means just as whites did is to underestimate grievously the segregative gulf between the two populations. The demographic processes, working on the black population until quite recently, do not have their analogs in the white population of the United States. They are to be found instead in the populations of developing countries or, more closely, in other minority populations living in close spatial but demographically and culturally separate relationship to a predominantly "modern" population. The closest parallel is probably found in New Zealand, where the Polynesian Maori component is similar in proportion to the whole population. The Maoris also had problems with syphilis and gonorrhea but not to the extent found among U.S. blacks (Pool, 1977).

Their traditional social and leadership system survived contact with whites; slavery denied blacks this advantage.

Significantly, a noticeable mortality decline among the Maori population began after 1910, virtually identical in timing to that of the U.S. blacks. Perceptible fertility decline, from levels similar to those of other Polynesian populations in the tropical islands of the Pacific rather than to those of white New Zealanders, did not begin until the late 1950s, again in timing virtually identical to the widespread adoption of intentional fertility control among U.S. blacks (Borrie, 1959).

The reasons for this parallelism bear further investigation but probably lie in technological, social, and political changes occurring more or less simultaneously in both countries. Pool (1977: 89) suggested that " 'modern' methods of contraception do not seem to have been widely used prior to 1961; although Maoris had heard of them and were sometimes interested in them, they did not possess detailed knowledge." A similar situation, we believe, existed among U.S. blacks, among whom only a sophisticated minority, mainly in the urban north, regularly practiced contraception for the purpose of achieving a small, controlled family size. For the rest the development of widespread deliberate family planning occurred only several decades after a mortality decline became obvious, in line with well-established demographic theory. We suggest that mean "desired family size" for southern blacks would have hovered about the traditional level of between six and seven children observed prior to Emancipation, rationalizations related to smaller achieved families aside, until the 1930s, when deliberate family limitation could have been expected to become sufficiently prevalent to lower the fertility curve substantially. The two curves, the potential or hypothesized TFR and the observed level, which around the year 1960 (near the top of the postwar fertility level) stood at a little over four children, may have intersected at that time.

Use of the condom, which figured so frequently in early accounts of contraceptive use among blacks (McFalls and Masnick, 1981: 91), could be related to its value as a prophylactic against venereal disease as well as its contraceptive function; and it may now be doubtful in retrospect which function was primarily intended.

CONCLUSION

The effects of the prevalence of venereal diseases among blacks after Emancipation cannot now be gauged. Without question, however, syphilis and gonorrhea must have blighted millions of lives, disrupted hundreds of thousands of families, and caused social and economic problems of tragic proportion. It is possible that, had there been no venereal disease, the U.S. black population would have numbered nearly 45 million in 1980 rather than the 26 million actually recorded by the census. This estimate omits any allowance for the extremely high rates of population growth likely to have occurred in the 1930s, 1940s, and early 1950s, if rates recorded in analogous populations are an indication. What the social, economic, and political consequences would have been of the black population's representing, say, 20 percent of the total U.S. population, rather than the current level of about 12 percent, can only be speculated upon, but it must have been profound.

The venereal diseases not only brought tragedy to black individuals and families but also probably aggravated the ethnic problems of the country, increasing the victimization of blacks socially, economically, and politically. It is difficult for us now to imagine the intensity of the dread and hostility that the risks of venereal diseases generated among the growing white middle class before the development of efficient treatment. To the anxious mothers and fearful wives who set its tone, few threats to their respectability and security were more terrifying.

The role of the recession of venereal diseases in the demographic and social reconciliation that has marked the relations between blacks and whites in recent decades has still to be objectively assessed. The previously wide discrepancy between white and black rates of venereal disease, suggested by the World War II Selective Service data to be of a magnitude 1 to 12, has been greatly narrowed, but not eliminated. The optimism about the prospects for complete control, borne of new experience with the "miracle drugs" immediately after World War II, has evaporated. Syphilis, gonorrhea, and a variety of other sexually transmitted diseases are having a troubling resurgence. Especially disquieting is the discovery that problems among blacks with STDs and their sequelae are at levels at least three times those of whites, although the explanation probably lies these days more with class differences than with race or culture. The southern states still account for a disproportionately large share of the VD cases recorded in the United States. According to a recent estimate nearly one million women in the U.S. suffer from pelvic inflammatory disease and its effects annually, and a projection of its prevalence level indicates a doubling by the end of the century (Curran, 1980: 850–51). The problem of involuntary infecundity is still with us: Surely it should not be another case of history forgotten and then relived.

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STUDIES
ON
THE VALUE
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The old-age economic security value of children in the Philippines and Taiwan

Susan De Vos

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PREFACE

This paper is based on the author's Ph.D. dissertation in sociology at the University of Michigan. Research was conducted at the University of Michigan's Population Studies Center under a predoctoral training grant from the National Institutes of Health (NIH). The author is grateful to Ronald Freedman, Lois Hoffman, Martin Whyte, and Mayer Zald for their advice and assistance. Rodolfo Bulatao and Te-Hsiung Sun kindly granted access to the Philippine and Taiwan Value of Children data. Fred Arnold and James Fawcett were most encouraging at an early stage of the project. The author gratefully acknowledges the comments of Rodolfo Bulatao, Alice Clark, Scott Grosse, James Fawcett, K. Radhakrishna Murty, and Lynn Wallisch on earlier drafts of the paper. Sandra Ward provided excellent editorial assistance. Sharon Kennedy, Janice Deneen, and Rochelle Reimer assisted in the preparation of the final manuscript. The revision was carried out under NIH postdoctoral training grant 5T32 HD07014 at the University of Wisconsin's Center for Demography and Ecology. Core support to the Center from the National Institute of Child Health and Human Development is also gratefully acknowledged.

ABSTRACT This paper compares individuals' perceptions of the value of children as economic security in old age in the Philippines and Taiwan. Drawing upon nationally representative, cross-societally comparable data from Value of Children surveys conducted in 1975 and 1976, it also examines the relation between children's economic security value and respondents' socioeconomic characteristics, attitudes, family-size preferences, and sex preferences. Respondents were wives of childbearing age.

Whereas most industrialized countries have developed specific social institutions that provide economic support to dependent elderly people, this function has been performed by the family in less industrialized countries. In countries undergoing development, such as Taiwan and the Philippines, the Value of Children study design assumed that socioeconomic status would influence respondents' perceptions of children's values, and that better educated and well-to-do wives would have more "modern" value orientations than less educated, lower-income women.

The findings reported here reveal that, in both the Philippines and Taiwan, expected reliance on children for financial support in old age ("support expectations") was substantial, but it was less prevalent among respondents in higher socioeconomic strata and those with more "modern" attitudes than among others. Multivariate analysis found socioeconomic characteristics and several attitudes to be independent predictors of support expectations.

Support expectations were found to affect fertility preferences, particularly the desire for four or more children, even after many potentially explanatory factors were controlled for. Support expectations from sons were found to be related to sex preferences in Taiwan but not in the Philippines, perhaps because Philippine women expected similar levels of support from both sons and daughters whereas women in Taiwan expected to rely primarily on sons.

FOCUS OF THE STUDY

THE ECONOMIC SUPPORT of dependent elderly people is a central component in the relationship between generations and has important welfare and demographic consequences. In traditional societies, the elderly are expected to rely primarily on their families for economic and emotional support (Simmons, 1960; Cowgill and Holmes, 1972). If family support mechanisms fail, community help may or may not be forthcoming. In modern societies, special institutions perform at least some of the economic support function (Barnes, 1952). Elderly people expect to rely on the working-age population at large for economic support.[1]

This study focuses on support expectations in the Philippines and Taiwan. Both societies are experiencing economic growth and are developing new ways of organizing work and welfare. At the same time, some segments of each society adhere to traditional modes of organization and interaction more than others. The incipient development of pension schemes is a case in point. Pensions are often available only to an urban elite who work for bureaucratized employers or who are organized into labor groups (Vreeland et al., 1979; Djang, 1977). This elite tends to be better educated and to consume more modern goods such as motorcycles, refrigerators, and televisions than other groups. On the other extreme are rural people, who organize their work according to more traditional family, patron, or community patterns, and who have less access to secondary or higher education, mass media, or modern consumer durables. But at present levels of pension benefits, where such benefits are available at all, they are still less than what is necessary to attain financial self-sufficiency in old age. In the mid-1970s most people in the Philippines and Taiwan expected to rely at least a little on children for financial support when old (Bulatao, 1975; Wu, 1977; Arnold et al., 1975).

The study investigates not only the kinds of support expectations respondents in the Philippines and Taiwan had from children, but also why their expectations varied. The speculated answer is that people with different expectations are associated with different modes of work and welfare organization, and that they have different social-psychological orientations affecting their feelings of personal efficacy and attitudes toward self-sufficiency in old age. Unfortunately, the study does not have information about respondents' expected pension benefits, but an examination of differences in their expectations from children may provide a clue to the possible determinants of their expectations.

The study also examines a possible relationship between expected reliance on children for support when old and fertility preferences. Demographers speculate that, in many developing countries, where most people do not have pensions or savings, they find greatest old-age insurance in their children (Neher, 1971; Willis, 1981; see also Notestein, 1945; Lorimer, 1954; Caldwell, 1982). If children tend to pool their resources to care for elderly parents, having more children may result in more resources. More children may also insure that at least one child will care for aging parents (Polgar, 1971; Jones, 1977).

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[1] "Traditional" and "modern" are of course ideal typical concepts, and one may expect considerable diversity among traditional or modern societies. The meaning of "transitional" or "developing" in this context may be confusing since most societies are probably in transition most of the time and may in fact be creating new traditions. Yet how else can one speak of change in the myriad facets of society that have coincided with the technological and economic innovations of the last several hundred years? (See O'Connell, 1976.)

Past research has documented that most parents in developing countries expect to rely on children for financial support when old (Bulatao, 1979a, 1979b; Kagitcibasi, 1982), although the extent to which this expectation is realized is an open question (Vlassoff and Vlassoff, 1980). It is also unclear whether people prefer large families because of old-age support considerations (Mueller, 1976; Coombs, 1980). Few studies have explored the connection between old-age security considerations and desired family size after controlling for other factors. One exception is a recently reported study by Vlassoff (1982), which found such a positive relationship among more traditional men only, in a village near Poona, India.

Also of interest is the relationship between expected reliance on *sons* for financial support in old age and an individual's sex preferences, especially in Taiwan, where son preference is strong. Demographers and family scholars have speculated that old-age support considerations may be an important correlate, if not structural support, for the preference for sons found in many parts of the world (Williamson, 1976).

Empirical support for the notion has been limited to traditionally patrilineal societies and has suffered from potentially serious data problems. For instance, Poffenberger and Poffenberger (1973) found an association between old-age support considerations and a desire for sons in India, but they did not control for other important factors that are probably related to support expectations and son preference, which could cause a spurious relation. Williamson (1976) used multivariate analysis to explore the determinants of son preference in rural Taiwan, but she did not investigate specific degrees of son preference or the nature of the relationship between expected reliance on children in old age and son preference among different social sectors. Furthermore, she and other researchers have had difficulty with measuring sex preferences independently from family-size desires. The present analysis extends previous work by addressing the relationship in two dissimilar societies, by examining the situation in the Philippines and in different sectors of Taiwan, and by using a measure of sex preferences that is theoretically independent from fertility preferences (Coombs, 1975).

The issue of old-age support expectations has policy significance. If parents do not expect to rely on children financially, they probably have a greater demand for nonfamilial welfare arrangements. If the expected old-age economic security value of children helps determine fertility preferences, security substitutes for children could possibly decrease the demand for children. If the security value of sons is a determinant of son preference, then an equalization of the perceived security value of sons and daughters could possibly affect people's sex preferences. This last hypothesis has probable consequences for the health and welfare of females (see Chen et al., 1981). Additionally, son preference may have important consequences for contraceptive use (Freedman and Coombs, 1974) and fertility (C.B. Park, 1978).

The reason why this study examines expected rather than actual or preferred reliance on children is that expectations address the future and may influence current preferences or future behavior. In contrast, present behavior may be based on ideas formulated in the past, and on needs and obligations that may not exist in the future.

A comparison of support expectations in the Philippines and Taiwan helps to speak to the generality of ideas concerning expected reliance on children for support in old age in developing countries. The two countries are close geographically but differ markedly in social and cultural background, as well as in recent rates of economic growth.

For instance, the traditional family in the Philippines is quite different from that in Taiwan. The traditional Filipino family is bilineal; people expect both sons and daughters to help parents in old age, and they tend to prefer a balanced number of sons and daughters. Interdependencies may extend beyond the nuclear or stem family to neighbors or other kinsmen. Child adoption by kinsmen occurs occasionally, and "kinship" ties may be established or strengthened through godparenting or coparenting (Yu and Liu, 1980). Most people may expect financial assistance from their children when old, but not having children does not necessarily leave one without care since responsibility for the elderly may be shared among community and family members. Furthermore, there may be little reason to prefer sons out of old-age considerations since old-age support has been expected from daughters as well as sons. In contrast, the traditional Chinese family is patrilineal, and responsibility for elderly parents is shared by sons only. Interdependencies are confined to the stem family, residually to brothers of the same father. Since sons usually cannot be adopted but must be born into each family, one might expect there to be strong links between support expectations, family-size desires, and son preference.

In addition, nontraditional ideas and behavior have probably permeated all sectors of society to a greater extent in the Philippines than in Taiwan. The Philippines was Christianized and colonized by the Spanish for over 300 years, and then colonized by America for a half century (Vreeland et al., 1979). In contrast, Taiwan's exposure to nontraditional ideas has been largely confined to this century and for the most part to the period after World War II (Chaffee et al., 1969). The Philippines has a higher level of educational attainment than most other East Asian societies. In the present study of women of childbearing age, over 25 percent of the Philippine sample had attended at least senior high school compared with less than 9 percent of the Taiwan sample.

It is true that Taiwan is economically more advanced than the Philippines. Twenty-two percent of the work force was in the primary sector in 1980 compared with 53 percent in the Philippines (Far Eastern Economic Review, 1981). Taiwan's GNP per capita in 1977 was estimated at US$1,180, compared with the Philippines's US$450 (World Bank, 1980). The proportion of the labor force in agriculture in 1970 is estimated to have been 35 percent in the Philippines and 55 percent in Taiwan (World Bank, 1980). However, Taiwan's development appears too recent to be reflected in more modern attitudes in all but the youngest and socially elite groups. Although family-related attitudes appear to be changing in Taiwan at a relatively rapid rate, as of 1976 they remained fairly traditional among the old and less advantaged population (Coombs and Sun, 1980).

THE DATA

This study uses nationally representative survey data of women of childbearing age in the Philippines and Taiwan, gathered as part of the cross-national Value of Children (VOC) Study.[2] To shed light on the psychological, social, and economic reasons why people have children, the study collected information on individuals' perceptions of the satisfactions and costs of children. The VOC survey questions, both open-ended and closed-ended, were well suited for an investigation of the old-age economic security value of children. They enquired about respondents' expectations of help from children, emotional and social values they attached to children, husband and wife decision making, religiosity, wife's work experience, and other family factors that should be controlled for when investigating a possible relationship between a respondent's expected reliance on children or sons, son preference, and fertility. The study also measured feelings of personal efficacy, exposure to mass media, and the possession of modern objects. The data set includes common measures of socioeconomic and demographic characteristics, as well as less common ones such as the Coombs IN and Coombs IS scales, which measure preferences for family size and gender composition, respectively.

Two rounds of in-depth interviews were conducted in the early and middle 1970s. Pretest surveys of about 400 respondents each were conducted in six countries, including the Philippines and Taiwan.[3] In the pretests, approximately equal numbers of urban middle-class, urban lower-class, and rural respondents were selected to maximize comparability between social groups. Respondents were cohabiting couples with at least one child. Wives were 20–34 years of age; husbands were 20–44. National representation was not a goal.

In the final round of surveys, improved question wording, national representation, and comparability across societies were important goals. National probability samples of 1,691 wives of childbearing age and a subset of their husbands were interviewed in the Philippines between September and December 1975, and 2,217 wives and a subset of their husbands and mothers-in-law were interviewed in Taiwan between January and April 1976.

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[2] Coordinators of the VOC Study were Fred Arnold, Rodolfo A. Bulatao, and James T. Fawcett at the East-West Population Institute. The co-investigators were Masri Singarimbun and Russell K. Darroch (Indonesia); Sung Jin Lee (Republic of Korea); Rodolfo A. Bulatao (Philippines); Peter S.J. Chen, Betty Jamie Chung, and Eddie Kuo (Singapore); Te-Hsiung Sun and Tsong-Shien Wu (Taiwan); Chalio Buripakdi, Nibhon Debavalya, and Visid Prachuabmoh (Thailand); Cigdem Kagitcibasi (Turkey); and Lois W. Hoffman, Fred Arnold, and James T. Fawcett (United States).

[3] The pretest was conducted in Taiwan, Japan, the Republic of Korea, the Philippines, Thailand, and the United States (Hawaii). See Arnold et al. (1975) for a comparative overview of the pretest results. See also Bulatao (1975) for the Philippine results and Wu (1977) for the Taiwan results.

The present study uses the wives' data from the two nationally representative surveys. In the Philippines the sampling frame was stratified into Manila and other areas. In Taiwan, townships were stratified on the basis of type of area, educational level, and total fertility rate. Women were selected from household registration lists. The response rate for wives in the Philippines was 91 percent, in Taiwan 93 percent.

The core questionnaire was originally written in English and then translated into the languages of the study areas. Questions were translated back into English to insure that the meaning had been retained in translation. Consistency checks were made during the fieldwork and coding stages.

Most of the Philippine interviewers were female college or university students. In Taiwan the women interviewers had at least a high-school education, were between 23 and 50 years old, and in most cases had participated in previous surveys.,(For more information on the VOC project, see Bulatao, 1979b; De Vos, 1982; and VOC Technical Notes, available upon request from the East-West Population Institute.)

FINDINGS

Major differences between the Philippines and Taiwan

The VOC survey asked respondents several open-ended questions about the advantages of having children and of having sons and daughters. Help in old age was mentioned as an advantage of having children by over 40 percent of the Philippine sample and by 29 percent of the Taiwan sample (Table 1). Less than 10 percent, however, volunteered old-age support as a reason to have a daughter. Moreover, lack of expectation of help from children in old age was rarely given as a reason for not wanting fewer children than respondents had said they desired to have.

One major difference between the Philippines and Taiwan was in responses to an open-ended question about the most important reasons for wanting a son. In the Philippines only 4 percent of the respondents mentioned old-age support. In Taiwan nearly half of all respondents mentioned it (Table 1).

A second major difference in responses to open-ended questions on

TABLE 1. Percentage of VOC respondents who mentioned old-age support in response to open-ended questions about the advantages of having children: Philippines (1975) and Taiwan (1976)

Question and order in which old-age support was mentioned	Philippines	Taiwan
What are some of the advantages or good things about having children, compared to not having children at all?		
1st mention	20	7
2nd mention	12	14
3rd mention	9	8
All mentions	41	29
What are some of the reasons why you would prefer not to have fewer than ____ children?[a]		
1st mention	2	1
2nd mention	1	1
Both mentions	3	2
What are the most important reasons for wanting a daughter?		
1st mention	2	6
2nd mention	6	3
Both mentions	8	9
What are the most important reasons for wanting a son?		
1st mention	1	13
2nd mention	3	34
Both mentions	4	47

a. Interviewer completed question by mentioning the number of children the respondent had earlier said she wanted to have.

the advantages of having children was that Filipinas mentioned both emotional and economic security advantages of children whereas Taiwanese seem to have mentioned economic security advantages only (figures not shown). This difference could be due to different coders' interpretations of similar responses or could represent true differences in Philippine and Taiwanese respondents' perceptions. In both countries there seemed to be little economic concern in responses to the question about the advantages of daughters.

Although responses to the open-ended questions on the advantages of children are informative, they have two major shortcomings in a study of this sort. First, the answers include both economic and emotional considerations, whereas the present study focuses on the economic security value of children only. Second, many respondents who do not independently mention old-age security as a reason to have children may still expect to rely on their children for support in old age.

VOC respondents were also asked several closed-ended questions on the importance of help in old age as a reason to have children (Table 2). In answer to the first, nine-tenths of the Philippine respondents and four-fifths of the Taiwanese affirmed that old-age dependency is a very important reason to have children. However, since almost everyone gave the same "very important" answer, the indicator has little variance either to be explained or to help explain anything else.

The second question asked whether being sure of having help in old age was a reason for wanting another child. Interestingly, such assurance was considered "very important" by most of the Philippine respondents but by fewer than half of the Taiwan respondents. This finding suggests that old-age considerations may have a greater effect on fertility preferences in the Philippines than in Taiwan—although, in Taiwan, the answers to the question were not related to whether respondents wanted an *additional* child. The question on help in old age did not specify economic help, and it explicitly drew a connection between old-age security and fertility for the respondent. It would have been preferable that no such connection existed in the question itself.

Fortunately, the VOC surveys contained other closed-ended questions on the perceived old-age value of sons and daughters that specified economic security but did not explicitly draw a connection between old-age security and fertility. There was a set of initial questions ("If you had sons/daughters, would you expect your sons/daughters to support you financially when you grow older?"), and follow-up probes ("Would you expect to rely on your sons/daughters a *great deal* for financial support when you grow old, or only a little?"). Answers to the initial and follow-up questions have been combined in Table 2. Responses of "no" to the initial question are coded as "none." "Yes" answers are differentiated by the amount specified in the answer to the follow-up question. The answers suggest, as did answers to the open-ended questions, that many women in both societies perceived children as having an old-age security value. This valuation appears

TABLE 2. Percentage distribution of responses to closed-ended questions about the old-age support value of children: Philippines (1975) and Taiwan (1976)

Question and response	Philippines	Taiwan
Importance of having someone to depend on when old as a reason for having a child		
Not important	2	7
Somewhat important	9	14
Very important	89	79
Importance of being sure that you will have someone to help you in old age as a reason for wanting an additional child		
Not important	10	47
Somewhat important	12	15
Very important	78	38
Amount of expected reliance on son/s		
None	14	13
A little	54	34
A great deal	32	53
Amount of expected reliance on daughter/s		
None	11	60
A little	58	37
A great deal	31	3
Amount of expected reliance on children[a]		
None	10	12
A little	55	34
A great deal	35	55

[a] Responses to this question are derived from responses to the two previous questions. Percentages represent respondents who expected to rely on daughters or sons not at all, somewhat, or a great deal.

fairly equal for sons and daughters in the Philippines but not in Taiwan. In Taiwan a majority (53 percent) of respondents expected to rely on sons a "great deal" for financial support when old, but only 3 percent expected to rely on daughters a great deal. In fact, a substantial majority did not expect to rely on their daughters at all.

Cognizant of this difference between the Philippines and Taiwan, I still wanted a measure of the old-age economic security value of *children* that could be used to compare the two countries. For this I combined responses to the separate questions on sons and daughters to form a single trichotomous variable called "support expectations" (last measure, Table 2). The "none" category contains responses of "no expectation" from either sons or daughters. The "great deal" category includes responses of individuals who expected to rely a great deal on either a son or a daughter. The middle category of "a little" contains the responses of people who expected to rely at least a little on a son or a daughter but did not expect to rely on either a great deal.[4] This categorization ignores the major difference between the Philippines and Taiwan concerning expected reliance on daughters.

Although most respondents in the Philippines and Taiwan expected to rely on children for financial support in old age, they varied considerably in how much reliance they expected to place on their children. In the Philippines roughly a third of the sample expected to rely a great deal on their children whereas about half expected to rely only a little. In Taiwan the obverse was true. Roughly half expected to rely a great deal whereas roughly a third expected to rely only a little. In both countries about a tenth of the samples did not expect to rely on children at all.

That Filipinas expected to rely less than Taiwanese women on children for financial support when old held true across all age groups and various socioeconomic strata, including women with higher incomes, in urban areas, or with husbands in upper white-collar occupations (Table 3). Only among women with some high school or more education did Filipinas expect to rely on children more than did Taiwanese.

Several factors could account for this difference between the Philippines and Taiwan. Differences in traditional family and community structures, historical experiences, and economic development could all be important. Parental expectations appeared to be declining in Taiwan at a relatively rapid rate during the 1970s (Coombs and Sun, 1981), and it is conceivable that they could have been declining in the Philippines as well. The two societies could exhibit different levels of expectations, and different variations in expectations, at some future point.

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[4] An analysis of the reliability of a similar question in a survey conducted in Taiwan in 1973 suggests that the VOC measure's reliability is on a par with that of other attitude measures. For a dichotomous measure, 86 percent of the respondents to a postenumeration survey provided the same response. When the possible variation is taken into consideration, a reliability index or reliability ratio can be calculated. With these measures, the reliability of the answers ranged between 42 and 47, out of 100 (Coombs, 1977).

TABLE 3. Support expectations by selected socioeconomic characteristics: Philippines (1975) and Taiwan (1976)

	Support expectations (%)									
	Philippines					Taiwan				
Characteristic	None	Little	Great	Phi[a]	(N)	None	Little	Great	Phi[a]	(N)
Total	10	55	35		(1,672)	12	34	55		(2,217)
Family income[b]				.19*					.30*	
10,000+	33	54	13		(80)	32	43	25		(359)
4,500/5,000–9,999	19	56	25		(259)	12	42	46		(791)
2,000–4,499/3,000–4,999	9	59	32		(575)	4	28	67		(527)
<2,000/<3,000	6	48	46		(718)	1	12	87		(195)
Husband's occupation[c]				.19*					.28*	
Upper white-collar	21	64	14		(90)	26	43	31		(539)
Mid/low white-collar	12	61	27		(316)	17	41	42		(288)
Upper blue-collar	na	na	na			7	39	54		(536)
Lower blue-collar	8	62	30		(530)	5	33	62		(337)
Farming/fishing	5	49	46		(667)	3	16	81		(426)
Education				.18*					.39*	
College	29	32	19		(145)	69	29	2		(58)
Senior high	15	63	23		(219)	47	46	7		(137)
Junior high	9	58	33		(280)	22	53	25		(215)
Grammar	8	55	37		(538)	8	37	54		(1,318)
<grammar	6	49	46		(470)	1	16	83		(489)

Residence[d]				.15*					.26*	
Urban barangay	14	68	18		(193)	na	na	na		
Urban	10	63	27		(349)	22	43	35		(417)
Rural barangay/mix	8	67	25		(159)	15	43	42		(957)
Rural	6	51	43		(986)	4	20	76		(827)
Mass media exposure[e]				.05					.24*	
Daily	12	54	34		(852)	23	45	32		(651)
Few times per week	10	56	37		(180)	15	39	46		(263)
Rarely	9	55	36		(491)	7	32	61		(714)
Never	6	52	42		(143)	6	22	72		(589)
Age				.05					.16*	
<25	8	55	37		(362)	14	45	41		(445)
25–29	9	56	35		(454)	18	39	43		(491)
30–34	13	50	38		(421)	10	34	56		(459)
35–39	10	58	32		(416)	10	30	61		(445)
40–45	na	na	na			7	22	71		(361)

na—not applicable.

* χ^2 significant at .05 if simple random sample.

a. A common measure of association, Phi can be used like χ^2 but is not dependent on N and can be used for asymetrically sized tables. Its formula is $(\chi^2/N)^{1/2}$.

b. Pesos per annum (Philippines); New Taiwan dollars (NT$) per month (Taiwan).

c. Upper white-collar occupations refer to professional, technical, administrative, executive, and managerial workers. In Taiwan lower white-collar occupations refer to sales and clerical workers. In the Philippines lower white-collar and upper blue-collar occupations are combined into "middle" occupations. In Taiwan, upper blue-collar occupations refer to upper skilled workers and upper service workers. Lower blue-collar occupations refer to low-skilled or unskilled workers and lower service workers.

d. *Barangay* = town center in the Philippines. Barangay residents were divided into those with urban experience (urban barangay) and those with rural backgrounds (rural barangay). "Mix" refers to Taiwanese respondents who had lived in both rural and urban areas; most were urban residents at the time of the interviews.

e. Frequency of listening to radio or watching television.

Socioeconomic and attitude differentials

The data reveal a pattern of expectations concerning reliance on children for financial support when old in both the Philippines and Taiwan, and the pattern requires examination. Why do some people expect to rely on their children a great deal whereas others only expect to rely on them a little? Are there systematic differences among socioeconomic groups or in attitudes that could help us predict an individual's support expectations?

People may have different expectations about supporting themselves without help from children. They may have different expectations concerning children's abilities to care for elderly parents. Or they could have different attitudes about relying on children for financial support when old. Such differences probably conform in part to differences among social groups. Yet it is difficult to discern to what degree such group differences are due to differential access to resources as opposed to differences of attitude. For instance, family income indicates economic resources, but it also implies different attitudes toward old-age living arrangements since people will have varying abilities to realize alternate lifestyles.

Other important social group indicators are education, husband's occupation, urban/rural residence, exposure to mass media, and age. Education (especially secondary education) requires resources and leads to more resources for the recipient in adulthood; but education may also cause exposure to new ideas, new ways of thinking, and preparation for participation in modern, nonfamilial institutions (Inkeles and Smith, 1974). Husband's occupation is an indicator of a family's financial resources, but it also places the family into a social group that shares common attitudes and access to information. Urban residents may have higher wages or greater economic opportunity than rural residents. They may also be more exposed to nontraditional ideas, modern goods, and nonfamilial economic institutions; and they may be less exposed to such traditional mechanisms of social control as community opinion or gossip. Exposure to mass media, which reflects ownership of radios or television sets, may influence attitudes. Inkeles and Smith (1974:174) caution, however, that the effect of mass media may depend on the economic constraints people face in adopting its messages.

Differences in age indicate different potential resources and different socialization experiences in rapidly changing societies. Younger people are often better equipped than the elderly to work in the modern, better-paying, industrial sector; and they may expect to be able to save for old age. They may also have less traditional attitudes toward the proper relationship between parents and children because they developed their ideas under more modern conditions.

Attitudes related to expected reliance on children in old age that are of interest are attitudes toward old age itself; attitudes toward children's responsibilities to their parents; perceptions of children's own attitudes toward caring for parents; general attitudes toward dependence, independence, and self-sufficiency; specific attitudes toward dependence in old age; and attitudes toward the government's role in providing old-age support. The comparative VOC data set has only a few of the potentially relevant variables, however. Several variables measure expectations of other kinds of help from both sons and daughters, and several measure personal efficacy. These are aggregated into two scales, labeled "other economic expectations" and "personal efficacy."

Additionally, the Taiwan survey asked attitude questions about young people's willingness to support parents and their capability of caring for parents, whether "modern" living makes it less convenient to live with parents, whether people should save for old age, and the best living arrangement for elderly parents.

In this section I examine the relationships between respondents' socioeconomic characteristics and attitudes on the one hand, and their support expectations on the other, in two steps. Before taking other factors into account, I consider bivariate differentials in support expectations. Then I examine the "independent" relationship between support expectations and each factor by controlling for other factors in a multivariate analysis. Several possible causal relationships are discussed.

Bivariate Differentials in Support Expectations

In both the Philippines and Taiwan the amount of reliance on children had a clearly negative relation to family income, husband's occupational status, and respondent's education (Table 3). As these may be the most standard of socioeconomic indicators, this similarity between the two societies is important.

However, support expectations also varied between the countries in several important respects. For one, exposure to mass media had no relationship to support expectations in the Philippines but was negatively related to support expectations in Taiwan. I had expected a negative relationship in both countries, since mass media could transmit Western ideas of greater independence between parents and children. The reason for a discrepancy between countries is unclear. Perhaps many people with access to radio and television were financially constrained from accepting the media's messages in the Philippines but not in Taiwan. Perhaps the media did not transmit messages promoting greater intergenerational independence in the Philippines but did so in Taiwan. Or possibly the effect of the media had already reached its saturation point in the Philippines, whereas it still produced a differential in Taiwan because of that society's more recent exposure to some of the messages.

A second difference between countries was a null relation between age and support expectations in the Philippines but a positive relationship in Taiwan, older women there expecting to rely more on children for financial support than younger women. The null finding in the Philippines could be used to argue against the life-cycle hypothesis, which is that women come to expect more support as they age. The Taiwan result could be interpreted as a real difference between generations born before and after World War II. Why this should have occurred in Taiwan but not the Philippines is, again, unclear. Perhaps the phenomenal economic growth that occurred in Taiwan after the war fostered a discontinuity between generations that did not occur in the Philippines, where economic growth was slower.

Third, socioeconomic differences in support expectations were less conspicuous in the Philippines than in Taiwan. For instance, the difference between women whose husbands were in white-collar occupations and those whose husbands were farm workers in their expectations of relying on children a "great deal" was 33 percentage points in the Philippines compared with 41 points in Taiwan (Table 3). This finding is consistent with the idea that the rate of economic development is positively associated with the size of differentials among socioeconomic groups since the rate of development had been lower in the Philippines. Other factors could have been at play here too.

The relationship between education and support expectations in Taiwan was striking, whereas it was similar to other differentials in the Philippines. In Taiwan 83 percent of respondents with less than a grammar school education expected to rely a "great deal" on children in old age, compared with only 7 percent of the respondents with a high school education and 2 percent of the respondents with a college education (Table 3). The corresponding figures in the Philippines were 46, 23, and 19 percent. It is possible that higher education alone produced the Taiwan effect. More probably, the relative newness of education for females caused the striking differential. Younger women were much better educated than older women in Taiwan, and higher education was still rare. Only 9 percent of the Taiwan sample had graduated from high school, compared with 22 percent of the Filipino sample.

I had expected urban residents to have lower support expectations than town or rural residents in both the Philippines and Taiwan. The urban/rural pattern in Taiwan fits expectations, but the pattern in the Philippines requires special notice. In the Philippines there was no smooth continuum from rural areas to settlements of ever-increasing size and density (Table 3). *Barangay* (town) residents with urban backgrounds had the lowest support expectations. Urban residents and barangay residents with rural backgrounds had similar and somewhat higher expectations. Rural residents had the highest expectations. Multivariate analysis revealed that this pattern is not explained by other socioeconomic characteristics or feelings of personal efficacy. Other researchers have also found indications that barangay residents, especially those with urban backgrounds, may be more modern than urban residents in their fertility characteristics (personal communication from Joseto Reoma, Population Studies Center, University of Michigan, October 1981).

Table 4 shows differential support expectations according to respondents' attitudes about other economic help from children and a composite psychological measure of personal efficacy. In both countries support expectations were positively related to expectations of other economic help from children and were negatively related to the measure of personal efficacy. Differences between countries were generally similar to those found for the socioeconomic differentials. In similar categories Filipinas expected to rely less on children than did Taiwanese. The range in expectations between categories tended to be greater in Taiwan than in the Philippines.

The Taiwan survey alone collected data on several attitudes that could be cross-classified with support expectations (Table 5). As expected, Taiwanese respondents who thought young people were less

TABLE 4. Support expectations by selected attitude measures: Philippines (1975) and Taiwan (1976)

	Support expectations (%)									
	Philippines					Taiwan				
Measure	None	Little	Great	Phi	(N)	None	Little	Great	Phi	(N)
Would you expect your sons/daughters to give you part of their salaries when they begin working?				.31*					.35*	
No	33	57	10		(176)	42	41	17		(439)
It depends	27	58	15		(282)	19	51	31		(65)
Yes	3	53	44		(1,214)	5	31	64		(1,713)
Would you expect your sons/daughters to help support younger brothers or sisters through school?				.31*					.37*	
No	46	47	7		(74)	51	36	13		(318)
It depends	43	44	13		(136)	23	72	6		(53)
Yes	5	56	39		(1,462)	6	32	62		(1,846)
Other economic help expected from children[a]				.39*					.42*	
No or it depends/No[b]	19	63	18		(675)	59	34	7		(216)
It depends						23	50	27		(393)
Yes	1	53	46		(1,016)	3	31	66		(1,608)
Personal efficacy scale[c]				.11*					.13*	
1 (high)	12	60	28		(612)	16	37	47		(1,086)
2	7	57	38		(439)	11	36	53		(520)
3	6	54	40		(329)	5	32	63		(360)
4 (low)	4	56	40		(311)	6	23	71		(251)

* χ^2 significant at .05 if sample were simple random sample.

a. Scaled variable derived from a combination of responses to the first two variables (see Appendix).

b. In the Philippines the "no" and "it depends" categories were combined because there were so few responses in either category. In Taiwan the three-variable category was retained.

c. Scaled variable derived from three attitude questions (see Appendix).

TABLE 5. Support expectations by attitude measures used in Taiwan only (1976)

	Support expectations (%)				
Measure	None	Little	Great	Phi	(N)
Do you think young people nowadays are more willing or less to support parents in old age?				.11*	
More	8	28	64		(353)
Same	10	31	59		(705)
Less	15	38	47		(1,139)
Do you think married young people nowadays are less capable of supporting parents?				.07*	
More	12	35	53		(991)
Same	10	31	59		(647)
Less	15	39	46		(551)
Do you think married young people nowadays are more willing to live with parents?				.13*	
More	6	26	68		(238)
Same	5	29	66		(416)
Less	15	37	48		(1,550)
Do you agree with people who say it is inconvenient to live with parents in this modern industrial society?				.09*	
Agree strongly	18	34	48		(113)
Agree slightly	16	35	49		(601)
Disagree slightly	11	37	52		(996)
Disagree strongly	8	28	63		(502)
Do you agree with people who think that a person should save money when young so that he does not have to rely on his children for financial support when old?				.30*	
Agree strongly	25	41	34		(703)
Agree slightly	10	41	49		(919)
Disagree slightly	1	21	78		(363)
Disagree strongly	1	8	91		(232)

TABLE 5. *(continued)*

Measure	Support expectations (%)				
	None	Little	Great	Phi	(N)
To solve old-age living problem of parents-in-law, with which statement do you agree most strongly: (a) Parents save money when young and live alone off savings or pension when old; (b) Parents live by themselves, but their children provide financial support; (c) Parents live with their children on rotational basis; or they live with one child but other children share parents' expenses.				.27*	
(a)	32	46	22		(396)
(b)	17	46	37		(217)
(c)	7	30	63		(1,596)

*χ^2 significant at .05 if sample were simple random sample.

willing nowadays to support their parents were more likely than others to expect *not* to rely on children for financial support in old age. The picture was similar for women who answered that young married couples nowadays tend to be less capable of taking care of elderly parents or that young people are less willing to live with parents, or who strongly agreed that it is inconvenient for a married couple to live with parents in the "modern industrial" society. A fourth of the respondents who strongly agreed that it is "wise to save money while young so that one does not have to rely on children when old" (almost a third of the sample) had no expectations of relying on children for economic support. A third of the respondents who thought that the best living arrangement for old people was to live separately from children and be financially self-sufficient did not expect to rely on children for financial support when old.

It is important to note, however, that even among the Taiwanese who expressed "modern" attitudes toward depending on and living with adult children, most still expected to rely on children for support in old age at least a little. This result could indicate the existence of constraints on desired self-reliance, ambivalence toward dependence on children, or inconsistent attitudes toward one's own future in contrast to an abstract future situation. A juxtaposition of answers regarding expected reliance on children, saving, and dependence suggests that most Taiwanese favored a system in which they could save but still depend on children for at least some financial support.

Multivariate Analysis of Support Expectations

Although the bivariate distributions in support expectations are informative, any of the relationships could be accounted for by other factors. For instance, the relationship between education and support expectations could be explained by the relationship between age and education or income and education. The relationship between exposure to mass media and support expectations could be explained by family income or husband's occupation. I therefore used multivariate analysis to estimate the independent relationship between support expectations and each predictor.

Multivariate estimation is done in several steps, in accordance with a causal assumption that will not be argued at length here. Those who do not accept the assumption, which is that socioeconomic characteristics antecede attitudes related to old-age reliance on children, may still find value in the empirical results. A first step in the multivariate analysis, then, is to enter the socioeconomic characteristics into an equation that does not have any of the attitude variables. The second step is to add the attitude variables to the multivariate equation. This accomplishes two things. First, it estimates the relationship between the attitude variables and support expectations after controlling for socioeconomic characteristics and other attitudes. Second, it estimates the relationship between socioeconomic characteristics and support expectations after controlling for the attitudes.

The support-expectations variable can be analyzed in two parts. A "none/some" part, measuring whether an individual expects to rely at all on children for financial support when old, combines expecting to rely "only a little" and "a great deal." This dichotomy turned out not to be important numerically at the time of the survey because almost everyone in the Philippines and Taiwan expected to have some reliance on children in old age. It may become more important in the future, however, if parental expectations decline. (See Kobayashi, 1977; Coombs and Sun, 1981.) A second "great/less" part of the support expectations variable distinguishes between expecting to rely on children "a great deal" on the one hand and "only a little" or "not at all" on the other. This part distinguished between roughly 40 and 60 percent of the samples.

It is possible that the socioeconomic and attitude characteristics examined here may have different importance for the two ways of distinguishing support expectations. For instance, attitudes may be more important in determining the none/some than the great/less distinction, whereas income and occupation may be more important in determining the great/less distinction.

Before presenting the results of the multivariate analyses, it may be appropriate to give a brief explanation of how to interpret results from logit regression. In the following tables, findings are interpreted in terms of the average (geometric) odds of being in the first rather than the second category of a dichotomous dependent variable. For example, in the Philippines, the odds of having no, versus some, support expectation was on average 1.37 times greater if someone had one more level of education–for instance, grammar school compared with no grammar school (Table 6). The likelihood of expecting not to rely at all was on average 1.51 greater with each increase in income category.

Column 1 in Table 6 contains estimated net effects of various socioeconomic characteristics on none/some support expectations in the Philippines and Taiwan. Findings are close to what one might expect, given the bivariate relationships. Income and respondent's education had significant net effects on none/some support expectations in both countries. Husband's occupation, urban residence, exposure to mass media, and age did not have significant effects in the Philippines but did so in Taiwan. It is particularly noteworthy, given the bivariate significance of husband's occupation, that it did not have a significant effect in the Philippines after income was controlled.

The results of adding the scale of personal efficacy to the equation are shown in Column 2. In the Philippines, the scale had a significant net effect on none/some support expectations but had little effect on the effects of the socioeconomic variables. In Taiwan the personal efficacy scale failed to have a significant net effect on none/some support expectations but it dampened the effect of urban/rural residence.

The effects of further adding a scale of other expected economic help from children (labeled "other economic help") are shown in Column 3 of Table 6. The net effect of the other economic help scale was quite significant in both countries. In the Philippines the differ-

TABLE 6. Logistic effects of socioeconomic and attitude factors on none/some support expectations: Philippines (1975) and Taiwan (1976)

(Logits transformed into natural odds)

	Support expectations							
	Philippines			Taiwan				
Variable	(1)	(2)	(3)	(1)	(2)	(3)	(4)	(5)
Husband's occupation	1.16	1.17	1.16	1.22*	1.26*	1.17		1.16
Residence	1.01	1.02	1.11	1.47*	1.25	1.35*		1.28
Education	1.37*	1.35*	1.16	2.29*	2.22*	1.67*		1.56*
Family income	1.51*	1.47*	1.33*	1.53*	1.49*	1.43*		1.37*
Media exposure	1.07	1.09	1.10	1.20*	1.19*	1.01		1.09
Age	1.10	1.11	1.10	1.23*	1.16*	1.01		1.10
Personal efficacy		1.31*	1.31*		1.16	1.13	1.27*	1.17
Other economic help			8.20*			4.57*	5.21*	3.97*
Willingness to support[a]							1.19	
Capable of supporting[b]							1.05	
Inconvenient to live with parents[c]							1.01	
Savings[d]							2.55*	2.25*
Living arrangements[e]							1.50*	1.40*

*Coefficient is at least twice its standard error.

a. "Do you think young people nowadays are more willing or less willing to support parents in their old age?"

b. "Do you think married young people nowadays are less capable of supporting parents?"

c. "Some people say it is inconvenient to live with parents in this modern industrial society. Others disagree. Do you agree?"

d. "Some people think that a person should save money when young so that he does not have to rely on his children for financial support when he is old. Others disagree. Do you agree?"

e. "To solve the old-age living problem of parents-in-law, which statement do you agree with most strongly? Parents save money when young, and live alone relying on their own savings or pension when they are old. Parents live by themselves, but their children provide financial support. Parents live with their children on a rotational basis; or parents live with one of their children but other children share parents' expenses."

ence between units of the dichotomous scale increased about eightfold the likelihood of having some expectation of relying on children when old. In Taiwan, the average difference between units of a trichotomous scale more than quadrupled the odds of having some expectation. Adding the other economic help scale also reduced the significant net effect of some of the socioeconomic variables. In the Philippines the effect of education in particular was reduced. In Taiwan the effects of age, exposure to mass media, and husband's occupation were reduced to insignificance. The independent effect of education was reduced but remained significant. Curiously, controlling for other economic help enhanced the effect of residence.

Additional logit regressions are possible with the Taiwanese data because the Taiwan VOC survey asked attitude questions not contained in the cross-national interview schedule (Table 5). A regression of none/some support expectations on the seven attitude variables is shown in Column 4 of Table 6. Four attitude variables stand out as significant net of the others: personal efficacy, other economic help, savings, and living arrangements. In Column 5 these four attitude variables are added to the socioeconomic variables. The results are similar to those found in Column 3, where personal efficacy and other economic help are added to the socioeconomic variables. Personal efficacy did not have a significant effect, but other economic help, savings, and living arrangements did. The effects of husband's occupation, exposure to mass media, and age were no longer significant. Neither was the estimated effect of urban/rural residence, but it was about the same as in Column 3. These findings support the assumptions that attitudes had an independent effect on none/some support expectations and that the effect of socioeconomic status can be explained in part by attitudes.

The multivariate analysis of the distinction between expecting to rely on children a great deal and less is shown in Table 7. As in the none/some analysis, the net effects of socioeconomic characteristics are shown in Column 1. In both the Philippines and Taiwan the effects of income, occupation, residence, and education were all important. The effects of residence were considerably larger than in the none/some case. The cross-national similarity in the predictive effect of these standard socioeconomic characteristics is important. On the other hand, the average effects were greater in Taiwan than in the Philippines, especially the effect of education. Mass media and age had

TABLE 7. Transformed logit coefficients for less/great support expectations on socioeconomic and attitude variables: Philippines (1975) and Taiwan (1976)

Variable	Philippines			Taiwan				
	(1)	(2)	(3)	(1)	(2)	(3)	(4)	(5)
Husband's occupation	1.18*	1.18*	1.22*	1.22*	1.26*	1.17*		1.15*
Residence	1.01	1.02	1.11	1.47*	1.44*	1.53*		1.38*
Education	1.21*	1.20*	1.11	2.22*	2.28*	1.91*		1.81*
Family income	1.32*	1.31*	1.23*	1.52*	1.51*	1.46*		1.31*
Media exposure	1.04	1.05	1.05	1.21*	1.20*	1.13*		1.17*
Age	1.04	1.05	1.04	1.16*	1.23*	1.19*		1.17*
Personal efficacy		1.11*	1.08		1.10	1.06	1.28*	1.06
Other economic help			2.94*			3.25*	3.86*	2.75*
Willingness to support							1.29	
Capable of supporting							1.02	
Inconvenient to live with parents							1.01	
Savings							2.03*	1.75*
Living arrangements							1.75*	1.68*

NOTE: See Table 6 for explanations of the attitude variables.

*Coefficient is at least twice its standard error.

net effects in Taiwan but not in the Philippines. These findings are similar to those in the none/some situation.

Personal efficacy is added to the equation in Column 2. As in the none/some situation, personal efficacy continued to have a net effect in the Philippines but not in Taiwan, once socioeconomic characteristics were controlled for. Additionally, controlling for personal efficacy had little effect on the socioeconomic coefficients. In contrast, adding other economic help (Column 3) produced a significant effect on great/less support expectations but less of an effect than on none/some support expectations. (The standard error for occupation was increased.) In the Philippines a difference of one unit in the dichotomous scale tripled the likelihood of expecting to rely on children a great deal. In Taiwan a difference of one unit in the trichotomous scale enhanced the likelihood by more than three times. Controlling for other economic help also reduced the net effects of the socioeconomic variables. In the Philippines education failed to have a significant net effect after other economic help was controlled for. In Taiwan, however, mass media and age continued to exert a net effect in the case of great/less expectations.

Columns 4 and 5 continue the examination of the effect of attitudes on great/less support expectations in Taiwan. Column 4 shows the net effects of the seven attitude variables before socioeconomic status is controlled for. As in the none/some situation, four of the seven–personal efficacy, other economic help, savings, and living arrangements–had significant effects. They are retained and added to the socioeconomic characteristics in Column 5. Controlling for the four attitudes reduced the net effect of the socioeconomic characteristics, but they remained significant. Except for personal efficacy, the attitude variables stayed significant net of the socioeconomic characteristics. This finding lends substantial support to the notions that part, but not all, of the socioeconomic differential in support expectations was due to factors other than the attitudes measured, and that, likewise, attitudes had a substantial independent effect on support expectations.

Expected old-age reliance on children and fertility preferences

It has been argued that people without pensions or savings will find greatest old-age insurance in their children (Neher, 1971) and that having more children increases the chance that at least one of them will become a filial adult capable of supporting elderly parents (Jones, 1977; Willis, 1981; Caldwell, 1982). Testing this hypothesis is complicated by the fact that different family systems have developed different rules for caring for elderly parents. For instance, according to the traditional Chinese norm, sons are responsible for their parents' welfare. According to the traditional Filipino norm, children of both sexes are responsible for parents. The amount of care expected may depend on other types of closeness between parents and children, and other kin or neighbors may be involved. Hence the connection between old-age considerations and fertility preferences could vary considerably between the Philippines and Taiwan. Fertility preferences rather than actual fertility are discussed here because the old-age security hypothesis addresses the *demand* for children. Since fertility is increasingly being controlled to reflect preferences, understanding the determinants of fertility preferences is an important endeavor.

Table 8 provides preliminary support for my assumptions that support expectations would be positively related to fertility preferences and that this relationship would be stronger in Taiwan than in the Philippines. For instance, there was a gap of .4 in Coombs IN between expecting a great deal of support versus expecting no support in the Philippines, compared with 1.1 in Taiwan. (See Appendix for description of Coombs IN.) The comparable gap in ideal family size was .4 in the Philippines and .9 in Taiwan.

Many things could explain this bivariate relationship. As we have already seen, support expectations were negatively associated with several socioeconomic characteristics known to be associated with fertility preferences (see also United Nations, 1973). If these characteristics were controlled, support expectations might not have a significant relationship with fertility preferences. Demographic factors such as age at marriage, fear of an infant death, actual number of children born, and attitude and knowledge about contraception could also cause a spurious relationship between support expectations and fertility preferences.

Controlling for actual fertility and people's knowledge and attitudes about contraception is a conservative stance. It runs the risk of overcontrolling because the causality could easily run the other way—from preferences to actual fertility and attitude about contraception. Examination of the effect of support expectations on Coombs IN and on ideal family size shows that controlling for current parity and attitude

TABLE 8. Average preferred fertility by support expectations: Philippines (1975) and Taiwan (1976)

	Support expectations (%)			
Country and measure	Total	None	Little	Great deal
Philippines				
Coombs IN[a]	4.9	4.7	4.8	5.1
Ideal family size[b]	3.6	3.4	3.5	3.8
Desired family size[c]	4.0	3.9	3.9	4.2
(N)	(1,530)	(153)	(835)	(542)
Taiwan				
Coombs IN[a]	4.7	3.9	4.4	5.0
Ideal family size[b]	3.0	2.4	2.7	3.3
Desired family size[c]	3.4	2.5	3.0	3.8
(N)	(2,085)	(265)	(715)	(1,105)

a. A scale measuring underlying fertility preferences (see Appendix).

b. The number of children a woman would ideally like to have if she could start her childbearing over again.

c. The number of children a woman currently has, plus additional wanted children and minus unwanted children. In Taiwan, this was current number of children plus additional wanted children only.

and knowledge about contraception affected the estimated effect of support expectations very little. In contrast, the control had a large effect on the estimated effect on desired family size, which is largely composed of current parity.

In addition, support expectations exist within a matrix of other family orientations. To determine whether support expectations exert an influence on fertility preferences independent from the influence of sex preferences and other economic, social, and emotional values of children, it is necessary to control for these various factors.

Most surveys include few, if any, measures of the value of children. A major strength of the VOC data set is that it contains numerous measures of the value of children besides that of old-age economic support. Measures of other economic values of children included expected labor on the family farm or in the family enterprise, expected wage contributions, and expected contributions toward the cost of a sibling's education (Nag, 1975). Measures of the emotional value of children included children's value as companionship against loneliness and the love and fun that children bring. Another, possibly important, measure was the child's value in binding a husband and wife together

(Hoffman, 1972). Social values of children measured included children's ability to continue a family line and the necessity of having children to fulfill religious or filial responsibilities (Goldsheider, 1971; Lorimer, 1954). The data set contains potentially relevant measures of husband-wife decision making and of the strain felt between mothering and engaging in other social roles (Goldberg, 1975).

Since there were so many possibly relevant measures, I combined individual measures into scales. I then tested the importance of each scale as a possible control for a relationship between support expectations and fertility preferences. If inclusion of the scale made no difference in the estimated effect of support expectations or in the explained variance (R^2), I omitted the scale from the final equation. The subset of possible control variables found to be important for the proper specification of a support-expectations–fertility-preferences relationship in the Philippines and Taiwan consisted of education, residence, husband's occupation, family income, exposure to mass media, age, age at marriage, actual fertility, attitude and knowledge about birth control, sex preferences,[5] a scale for other economic values of children, and a scale for certain social values of children (see Appendix).[6]

I have presumed that the trichotomous support-expectations variable is best treated as a set of dummy variables in multiple regression. The dummy contrast between the first two categories is labeled "none/little." The second contrast is between the second two categories and is labeled "great/little." These contrasts are different from the dichotomies mentioned before, which combined two categories into one to form contrasts between one category and the other two (p. 21). The none/little expectations difference I hypothesized to have little effect on fertility preferences because it distinguishes between people who are fairly "modern" and who tend to desire small families irrespective of the economic value of children (see also Bulatao, 1981). In contrast, the difference between expecting to rely on children a great deal and expecting to rely on them only a little could have a substantial effect on fertility preferences because it probably distinguishes between more or less traditional individuals for whom the economic value of children does affect family-size preferences. (I also investigated the potential importance of several interaction effects. One was the idea that support expectations could have a greater than average effect among women with nontraditional attitudes toward other family relations, but it proved to be unimportant.)

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[5] Measures of sex preference in the Philippines and Taiwan are based on Coombs IS. The Philippine measure emphasizes the strength of either daughter or son preference. The Taiwan measure emphasizes the strength of son preference. (See Appendix.)

[6] I left attitude toward birth control in the Taiwan model to satisfy readers who may consider this variable too important to omit despite my empirical finding that it was not important. I omitted income in the case of Taiwan because it is inconsequential for an estimate of an effect of support expectations on fertility preferences once education is controlled for and also because responses on income were missing for 15 percent of the cases. These cases would be lost if I included income.

The net effects on fertility preferences of the two distinctions in support expectations are shown in Table 9. In addition to the three measures of fertility preferences included in Table 8, results for whether the respondent wants an additional child are also shown, as are results for the net relationship between support expectations and number of surviving births. (Number of surviving births is a better measure of fertility than parity here since we are concerned with the old-age security value of children.)

Results for each measure of fertility preferences (Table 9, rows 1–4) were consistent in both the Philippines and Taiwan in that there was no net effect of none/little support expectations on fertility preferences, but there was a significant net effect of great/little support expectations. Coefficients for Coombs IN and for ideal family size were identical for the Philippines sample (.25) and differed by only .02 for the Taiwan sample (.19–.21). The estimates of desired family size are also surprisingly consistent, at roughly one-tenth of a child.

In both the Philippines and Taiwan the coefficients for the desired family-size measure were only half the size of the ones for Coombs IN and for ideal family size. There is a ready explanation for this that illustrates the advantage of using Coombs IN or ideal family size to measure fertility preferences. The scale for desired family size is constructed by adding number of additional wanted children to current parity and subtracting number of unwanted children. Since the measure relies heavily on current parity, current parity overcontrols the relation between the two main variables whereas controlling for parity alters the coefficients for Coombs IN and for ideal family size hardly at all (figures not shown).

The advantage of considering the effect of support expectations on

TABLE 9. Multiple regression coefficients for effect of amount of expected reliance on children for financial support when old on selected measures of fertility preferences: Philippines (1975) and Taiwan (1976)

	Support expectations[a]					
	Philippines			Taiwan		
Measure	Great/ little	Little/ none	(N)	Great/ little	Little/ none	(N)
Coombs IN	.25†	−.03	(1,463)	.19†	.01	(1,859)
Ideal family size	.25†	.02	(1,463)	.21†	.03	(1,859)
Desired family size	.12*	.08	(1,463)	.11†	.03	(1,856)
Odds want an additional child[b]	1.35††	.74	(1,361)	1.54††	1.07	(1,928)
Surviving births[c]	.06	−.24	(1,103)	.16*	−.01	(1,543)

NOTE: The regressions control for age, age at marriage, live births, attitude toward contraception, family orientations, and socioeconomic characteristics (see text for details).

* Significant at .05 if sample were simple random.

† Significant at .01 if sample were simple random.

†† Significant at twice its standard error.

a. The measure of support expectations has been transformed into three dummy variables corresponding to each category (none, little, and a great deal). The "little" dummy has been omitted, and the estimated contrasts are the contrasts between this omitted category and the two included categories.

b. Coefficients for this measure are derived from a logit regression on the odds ratio of wanting more children/not wanting more children. The coefficient refers to the multiplicative effect of the contrasts in their "natural states."

c. The number of children a woman currently has minus any infant or child deaths at the time of the survey.

fertility preferences rather than on actual fertility is also demonstrated. In the Philippines, where fertility has not been widely controlled to reflect people's preferences, support expectations had no effect on actual fertility (Table 9, row 5). In Taiwan, where fertility has been increasingly controlled to reflect people's preferences, support expectations did affect actual fertility.

I had speculated that support expectations might have more effect on fertility preferences in Taiwan than in the Philippines because old-age reliance may have been more concentrated on parents' own children there as opposed to other kin or neighbors. This hypothesis was partially confirmed by the bivariate fertility differentials (Table 8), indicating that the gap in fertility preferences was much larger in Taiwan than in the Philippines. However, the speculation was not borne out by the multivariate analysis. On the contrary, after I controlled for other factors, the net effect of support expectations on fertility preferences tended to be somewhat greater in the Philippines than in Taiwan for three of the four measures of fertility preferences.

There are two common ways to "control" for other factors when examining a relationship between support expectations and fertility preferences. The first way was performed above. Other factors are entered into a single equation and their average effects controlled for. One may find that controlling for urban/rural residence or for education accounts for part of a bivariate relationship. However, this approach does not take account of the possibility that there is a relationship between support expectations in some categories of the control variable but not in others. For instance, it is possible that a support-expectations relationship existed among rural residents but not urban ones, or that it existed among people with only a grammar school education or less but not among more highly educated people. To test for this possibility requires a second method of control, commonly used in the perusal of cross-tabulations. Separate regressions must be estimated within each category of the control variable of interest. The advantage of using multiple regression over usual cross-tabular methods is that it is possible to combine the two forms of control by estimating separate regressions using all of the other control variables except the one of special interest, for which the sample is broken into subgroups.

All of the control variables used above could be analyzed in this fashion, but I have selected parity and a few variables from each of three other types: socioeconomic, social-psychological, and family. The list is not intended to be exhaustive. Rather, it is exploratory and based on intuition.

Since the difference between none and little support expectation had no effect on fertility preferences in either the Philippines or Taiwan, the following discussion focuses on the great/little difference in support expectations, which I refer to simply as "support expectation." Estimated coefficients have relatively large standard errors, and differences between coefficients tend not to be statistically significant. The major information to be derived is whether or not an effect is significant. Intersociety comparisons can be made on a general level only.

It would be ideal to use all of the available measures of fertility preferences as a way to test the consistency and reliability of the results. Unfortunately, except for the general overview, it is not possible within the scope of this monograph. I choose to focus on whether an additional child is wanted and on Coombs IN. The estimated coefficients for Coombs IN have standard errors that are smaller than for ideal family size or desired family size. This is an important practical consideration when dealing with relatively small subsamples. Still, there is the possibility that at least some of the insignificant findings may be due to relatively small sample sizes.

Reliability checks on the within-strata estimates disclose occasional inconsistencies between results for Coombs IN and for ideal family size. In most cases these inconsistencies appear explainable by the structural differences in the two measures, which tend to be accentuated among small samples. In most cases, too, Coombs IN appears to yield the more consistent results, probably because it is more sensitive to variation in underlying preferences. The reason for such discrepancies is an area in need of empirical investigation.

Parity Differences

A component of the hypothesis is that support expectations affect the preferences for higher-order births but not lower-order births because most people want at least a couple of children irrespective of children's perceived economic value. To examine the possible specification of a relationship between support expectations and fertility preferences by parity, it makes most sense to use the variable of whether an additional child is wanted to indicate fertility preferences, since other fertility-preference variables are less related to parity. I therefore used logit regression on the odds ratio of whether an additional child is wanted. The estimated effects are presented in their "natural" state, having been transformed back from their logs.

The findings (Table 10) support the idea that the relationship between support expectations and fertility preferences was specific to higher parities. In neither the Philippines nor Taiwan were support expectations related to whether respondents at parity 0, 1, or 2 wanted an additional child. But in both countries a relationship emerged between support expectations and whether women of parity 3 wanted an additional child—that is, whether they wanted a fourth child. And in the Philippines, among respondents of parity 4 or more,

TABLE 10. Logistic effect of expecting to rely on children "a great deal" versus "a little" on the odds of whether respondent wants an additional child, by parity: Philippines (1975) and Taiwan (1976)

	Whether an additional child is wanted			
	Philippines		Taiwan	
Parity	Odds[a]	(N)	Odds[a]	(N)
0		(99)		(100)
1	.9	(223)	1.4	(233)
2	.9	(275)	1.6	(346)
3	1.9*	(258)	2.9*	(522)
4+	2.3*	(642)	1.5	(761)

NOTE: The regressions control for demographic, family, and socioeconomic characteristics (see text).

* Significant at twice its standard error.

a. The coefficients correspond to the odds of wanting an additional child versus not wanting an additional child.

support expectations were related to whether another child was wanted—that is, whether a respondent wanted a fifth or higher-order child.

The country-specific results for parity 4 or more may be explained by the distribution of fertility preferences in the Philippines and Taiwan. In the Philippines 29.0 percent of the sample considered four children to be an ideal number and 16.9 percent considered five or more children to be ideal. But in Taiwan only 2.8 percent considered more than four children to be an ideal number. It is not surprising, then, that support expectations did not have a significant effect in distinguishing this 2.8 percent from the others.

In contrast, the estimated effect of support expectations on whether another child was wanted was substantial among women of parity 3 in Taiwan; the odds of wanting another child were almost 3 to 1 compared with 2 to 1 among the same parity group in the Philippines. This finding is consistent with the idea that there may be a threshold below which desired family size may not drop without radical changes in certain important family orientations and existential circumstances, the old-age economic security value of children being one of these (Freedman et al., 1980).

Socioeconomic Differences

Three common indicators of socioeconomic status have been chosen for special consideration: education, residence, and husband's occupation. These variables were found to have a strong dampening effect on the bivariate relationship between support expectations and fertility preferences in both societies (figures not shown). This finding could indicate at least two things: that the average relationship between support expectations and fertility preference was weaker within each subcategory, or that the relationship existed in some categories but not in others. The second interpretation is more likely to be accurate because, as reported in the previous section, people in lower socioeconomic groups tended to have greater support expectations than those in higher socioeconomic groups, and it is the lower socioeconomic groups who also tended to prefer higher fertility (figures not shown).

The estimated effect of great/little support expections on Coombs IN within different socioeconomic subgroups is shown in Table 11. In both countries the size and the statistical significance of the estimated effects declined with increases in status. For instance, in both countries among respondents with less than a primary school education, support expectations had a significant net effect of .40 on Coombs IN, but among respondents with a junior high school education or more the effect was insignificant, at most .05. The coefficients for other variables were not as similar but followed that same general pattern. For instance, support expectations had a significant effect of .23 among rural residents but an insignificant effect of .18 or .08 among urban residents.

There were differences between countries, of course. For husband's occupation, for instance, the effect of support expectations on Coombs IN occurred among respondents of higher socioeconomic status in Taiwan than in the Philippines. In Taiwan only respondents whose husbands had white-collar occupations showed no significant relationship between support expectations and fertility preferences whereas in the Philippines only the farming and fishing respondents did show a significant relationship. This finding could have several explanations, including the countries' different traditional family structures or lengths of exposure to modernizing forces. Another possibility is that the smaller sample sizes, coupled with the number

TABLE 11. Multiple regression contrast of great/little support expectations on Coombs IN by selected socioeconomic characteristics: Philippines (1975) and Taiwan (1976)

	Philippines		Taiwan	
Characteristic	Great/little	(N)	Great/little	(N)
Education				
Junior high+	.04	(570)	.05	(338)
Grammar	.31*	(487)	.16†	(1,109)
<grammar	.40†	(425)	.43†	(407)
Residence				
Urban	.18	(303)	.08	(346)
Urban barangay	.18	(162)		
Rural barangay/mix	.56*	(140)	.17*	(817)
Rural	.23†	(871)	.23†	(691)
Husband's occupation[a]				
Upper white-collar	.55	(73)	.07	(467)
Mid/low white-collar	.18	(318)	.24†	(726)
Upper blue-collar	na	na	.27†	(469)
Lower blue-collar	.06	(414)	.26*	(282)
Farming/fishing	.33†	(556)	.23*	(388)

NOTE: The regressions control for age, age at marriage, knowledge and attitude about contraception, parity, family orientations, and socioeconomic characteristics other than the one being stratified.

na—not applicable.

* Significant at .05 if sample were simple random sample.

† Significant at .01 if sample were simple random sample.

of control variables employed in the multivariate analysis, in some cases obfuscated the existence of a true relationship (De Vos, 1983).

Social-Psychological Differences

The possibility of an individual, social-psychological effect on the relationship between support expectations and fertility preferences is also of interest. In the previous section I reported that a scale of personal efficacy was related to support expectations before socioeconomic variables were controlled for (Tables 7 and 8). Instead of estimating the great/little support-expectations effect within categories of the personal efficacy scale, however, it is more advantageous to control for two of the scale's constituent variables because the results are more easily interpretable. I also selected another social-psychological variable for special analysis, what the respondent considered most important to her. Of particular interest to me was whether emotional matters, financial security, or family continuity was considered most important. I regarded the variables of personal efficacy and the most important thing as good social-psychological controls because they were not explicitly related to, and were theoretically independent of, the value of children.

I hypothesized that individuals who view planning ahead as useful, who believe they influence things that happen to them, or who regard financial security as the most important thing in life will tend to be influenced by support expectations in their fertility preferences because it is they who will tend to see old-age insurance in having children. On the other hand, for people who do not believe in planning, believe they have little influence over their lives, or consider emotional attachments to be most important, old-age considerations will probably have little effect on their desire for children.

The hypothesis is complicated by the fact that people with strong feelings of efficacy could have confidence in providing for themselves in old age and therefore tend to expect to rely less on children (Table 5). However, it is also among this group, I conjecture, that the intensity of support expectations and fertility preferences would be strongest. Hence, there could be a stronger relationship between the two characteristics than among people with lower feelings of efficacy.

Regression analysis failed to bear out this hypothesis (Table 12). Perhaps because of the complication mentioned above, no consistent pattern emerged in the way social-psychological characteristics specified the support-expectations effect. For instance, a significant effect of support expectations was observed among the group who agreed strongly that "it is not wise to plan too far ahead" in the Philippines, but no such effect surfaced for the same group in Taiwan. A similar inconsistency can be observed for the personal efficacy variable. I observed yet another ambiguity in the Taiwan data when examining the relationship between support expectations and fertility preferences within categories of a scale of social-psychological modernity that could have "smoothed" out idiosyncratic answers to several social-psychological questions. In contrast, results using the Philippine scale were consistent with the hypothesis.

The only finding that supports the hypothesis is that there was a significant support-expectations effect among people who considered

TABLE 12. Multiple regression contrast of great/little support expectations on Coombs IN by selected social-psychological orientations: Philippines (1975) and Taiwan (1976)

Orientation	Philippines Great/little	Philippines (N)	Taiwan Great/little	Taiwan (N)
It is not wise to plan too far ahead				
Disagree	.12	(450)	.21†	(576)
Agree slightly	.14	(513)	.27†	(649)
Agree strongly	.47†	(543)	.09	(629)
You have little influence over the things that happen to you				
Disagree	.20	(470)	.16	(281)
Agree slightly	.12	(526)	.25†	(882)
Agree strongly	.42†	(510)	.16	(281)
Emotional considerations, financial security, or continuation of the family name is the most important thing				
Emotions	.18	(777)	.23†	(817)
Financial security	.30†	(597)	.28†	(400)
Family continuity	.59*	(108)	.09	(637)

NOTE: The regressions control for age, age at marriage, knowledge and attitude about contraception, parity, family orientations, and socioeconomic characteristics.

* Significant at .05 if sample were simple random sample.

† Significant at .01 if sample were simple random sample.

financial security to be the most important thing. Yet among people who considered family continuity most important, the support-expectation effect was significant in the Philippines but not in Taiwan. Obversely, there was such an effect among people who considered emotional matters most important in Taiwan but not in the Philippines.

One cannot overemphasize the difficulty in devising social-psychological survey measures that are truly comparable across cultures. It is possible that the VOC questions had different interpretations for respondents in the Philippines and Taiwan. It is also possible that the measures used are comparable between societies but do not illuminate the determinants of a support-expectations–fertility-preferences relationship.

Differences in Family Orientation

Support expectations exist within a matrix of family orientations about children. The question naturally arises, therefore, whether there are other orientations that could help specify the support-expectations–fertility-preferences relationship. Three variables are selected here for perusal out of the many possible variables contained in the survey. They are religion ("How important is your religion as a reason to have children?"), strain ("How much worry or strain do children cause?"), and sex preference (that is, preference for children of a particular sex).[7]

The religion variable captures a dimension of family orientation thought to change radically with development (Barnes, 1952) and of traditional importance to the sociologist. Responsibility in the care of elderly parents is furthermore a moral obligation taught by most religions. Hence I hypothesized that a support-expectations effect would more likely occur among individuals who considered religion an important reason to have children than among other individuals.

Results of the empirical analysis (Table 13) did not entirely support this conjecture, however. As expected, in the Philippines there was a support-expectations effect among people who considered religion to be important but not among people who did not consider it important. In Taiwan there was a support-expectations effect among people who considered religion to be very important, but there was also such an effect among people who considered religion unimportant.

Central to the old-age security hypothesis is the notion that the support-expectations effect exists where there is little perceived cost to having many children, where a number/quality tradeoff does not exist. If couples perceived such a tradeoff, they might consider it wiser to have only a few children who would be able to support the parents handsomely in their old age rather than to have many children with little ability to support the parents (Caldwell, 1982; De Vos, 1983).

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[7] The support-expectations–Coombs-IN relationship was also examined within two types of household, nuclear and extended. In both countries the relationship was significant within both household types. In neither country was there any indication of a difference in the size of the estimated relationship according to type of household.

TABLE 13. Multiple regression contrast of great/little support expectations on Coombs IN by selected family orientations: Philippines (1975) and Taiwan (1976)

Orientation	Philippines Great/ little	Philippines (N)	Taiwan Great/ little	Taiwan (N)
How important is your religion as a reason to have children?				
Not important	.09	(322)	.20*	(693)
Somewhat important	.50†	(467)	.14	(459)
Very important	.26†	(693)	.20†	(691)
How much worry or strain do children cause?				
Very much	.10	(280)	.28†	(1,171)
Some	.25†	(747)	.03	(459)
Little/none	.39†	(474)	.31*	(220)
Sex preference[a]				
Neutral	.06	(381)	.15	(151)
Moderate	.25†	(700)	.24†	(1,101)
Strong	.43†	(401)	.09	(602)

NOTE: The regressions control for age, age at marriage, attitude and knowledge about contraception, parity, various family orientations, and socioeconomic characteristics (see text for details).

* Significant at .05 if sample were simple random sample.

† Significant at .01 if sample were simple random sample.

a. Based on Coombs IS preference scale. In the Philippines, this orientation refers to strength of either girl or boy preference. In Taiwan, it refers only to strength of son preference. (See Appendix.)

This notion motivated the selection of the strain variable. I conjectured that there would be a support-expectations effect among respondents who felt little or no strain from having children. In contrast, there would be no such effect on fertility preferences among people who felt a lot of strain from having children.

The empirical test, shown in Table 13, did not provide clear support for the strain conjecture. In the Philippines, it is true, there was a support-expectations effect among people who perceived little or only some strain from having children, and the estimated effect was greatest among those who perceived little or no strain. Yet the Taiwan findings went against expectations. Most respondents considered children to cause a great deal of worry or strain, but there was a substantial support-expectations effect among those individuals. Again, the strain question appears to have meant different things to respondents in the Philippines and Taiwan. In the Philippines the proportion perceiving a great deal of strain appears more in line with what was expected—about one-sixth of the sample. Thus no positive statement can be made concerning the impact of a number/quality tradeoff on a support-expectations effect.

I also wanted to test the idea that people without a preference for the sex of their offspring probably do not connect old-age security considerations with fertility preferences whereas people with a strong sex preference probably do make such a connection. This argument appears more compelling for Taiwan than for the Philippines since, in Taiwan, people tend to depend on sons only whereas in the Philippines they tend to depend on children of both sexes. In fact, I measured the strength of sex preference differently in the Philippines than in Taiwan. A "strong" sex preference in the Philippines referred to a strong preference for either boys or girls, but it was specific to a strong preference for boys in Taiwan (see Appendix).

As with the other two family variables, the expected effects, shown in Table 13, were found in the Philippines but not in Taiwan. In the Philippines, the strongest support-expectations effect was found among individuals with a strong sex preference, but there was no significant effect among people with a neutral sex preference. In Taiwan, in contrast, there was no significant support-expectations effect among people with a neutral sex preference or a strong boy preference. A closer examination of this latter finding disclosed a high correlation between having a strong boy preference and expecting to rely on children a great deal. There may have been insufficient possibility for covariation among this group for there to be a significant effect (figures not shown).

Sex preference and expected financial support from children

People in most societies exhibit a preference for children of one sex over another, for still poorly understood reasons (Williamson, 1976). Where there is a preference for one sex by an overwhelming majority of a society, it is often hypothesized that the society has ascribed different, and unequal, functional values to daughters and sons. For instance, in societies with families organized patrilineally, such as among the Chinese, sons only are permitted to continue the family line, and they are expected to care for their elderly parents. Daughters, on the other hand, marry into their husbands' families (Goode, 1970; Baker, 1979). Yet daughters may have more emotional value than sons, at least to fathers. Whereas fathers may relate to their sons along formal, socially expected lines, they may feel freer to establish warm, spontaneous relationships with their daughters (Baker, 1979). The economic and family-continuity factors seem to dominate sex preferences, however, because people in patrilineal societies prefer sons (Freedman and Coombs, 1974; Williamson, 1976; Coombs and Sun, 1981).

The situation in the Philippines has been quite different from that among the Chinese, for the traditional family has been bilineal, not patrilineal. Daughters as well as sons stay attached to parents' kin groups after marriage and are expected to care for elderly parents. There is no structural or religious need to produce an heir in the Philippines the way there has been in Chinese society (Vreeland et al., 1979; Yu and Liu, 1980). According to a functional perspective, then, it may not be surprising that Filipinas in the VOC study were more or less evenly divided between preferring daughters and preferring sons, and that about a quarter preferred a balance of daughters and sons. The determinants of variation in sex preference in the Philippines, in contrast to Taiwan, appeared less socially determined and were, perhaps, more psychologically determined.

Differences Between the Two Societies

The marked contrast between the Philippines and Taiwan in support expectations and sex preferences is shown in Tables 14 and 15. In the Philippines only 14 percent of the sample expressed different support expectations for sons and daughters (Table 14). In Taiwan more than two-thirds of the sample expressed greater support expectations for sons than for daughters. For instance, 50 percent of the sample reported expecting a great deal of support from sons but not from daughters. Less than 1 percent of the sample reported expecting a great deal of support from daughters but not from sons. There was as much daughter preference as son preference in the Philippines (39 versus 36 percent of the sample), whereas only 8 percent of the Taiwan sample did *not* prefer sons (Table 15).

There is also strong empirical support for the notion that old-age

TABLE 14. Percentage of VOC respondents who expected to rely on sons and daughters for financial support when old: Philippines (1975) and Taiwan (1976)

	Philippines		Taiwan	
Expectation	%	(N)	%	(N)
No support from either	10	(159)	13	(277)
Little support from son, none from daughter	2	(29)	19	(428)
Little support from daughter, none from son	2	(38)	*	(3)
Little support from both	50	(810)	15	(321)
Great support from son, none from daughter	1	(14)	28	(620)
Great support from daughter, none from son	1	(14)	*	(1)
Great support from son, little from daughter	5	(75)	22	(498)
Great support from daughter, little from son	3	(50)	*	(5)
Great support from both	26	(424)	3	(64)

* Less than 1.

support considerations were strongly tied to sex preferences in Taiwan but not in the Philippines. The cross-tabulations of support expectations from sons and sex preference are shown in Table 16. (It is worth remembering that in the Philippines support expectations from daughters were almost identical with support expectations from sons whereas in Taiwan it was possible to collapse no preference, slight daughter preference, and strong daughter preference into one category because so few respondents expressed anything but son preference.) In the Philippines respondents expressed the same distribution of support expectations irrespective of their sex preferences. In Taiwan respondents with a strong son preference were much more likely than others to expect a great deal of support from sons.

This leads to the proposition that expected reliance on sons for financial support in old age is related to, and may help cause, son preference under certain conditions but not under others. The nature of the lineage system, whether it is patrilineal or bilineal, appears to

TABLE 15. Percentage distribution of individual sex preference (Coombs IS): Philippines (1975) and Taiwan (1976)

	Philippines		Taiwan	
Coombs IS	%	(N)	%	(N)
1. (Daughter)	2	(36)	0	(2)
2.	11	(177)	1	(11)
3.	26	(418)	1	(26)
4. (Neutral)	26	(418)	6	(126)
5.	22	(355)	59	(1,193)
6.	12	(201)	32	(641)
7. (Son)	2	(7)	1	(29)

NOTE: Coombs IS is an ordinal scale ranging from strong daughter preference (1) to strong son preference (7). (See Appendix for details.)

be an important factor. But what about possible change in the relationship between expected reliance on sons and son preference within a traditionally patrilineal society itself? The question is worth asking because son preference is part of a central patrilineal pivot around which the traditional Chinese family operates. Examining the relationship could provide valuable insight into the "modernization" of the Chinese family.

Association Between Sex Preference and Support Expectations in Taiwan

Two avenues seem possible for a looser connection between son preference and expected reliance on sons over time in Taiwan. One is that one or both of the elements in the traditional relationship attenuates so that covariation becomes impossible. That is, either support expectations from sons or son preference disappears. A second way is that the traditional orientations persist but they become less and less associated with each other. This would seem particularly possible if the traditional association were not causal.

The cross-sectional VOC data provide a clue as to whether there is a diminishing relationship between expected reliance on sons and son preference in Taiwan if one assumes, tentatively at least, that socioeconomic differentials express differences in modernity level and indicate directions of change. There is considerable support for this assumption. In general, upper strata appear to adopt many new atti-

TABLE 16. Sex preference by amount of expected reliance on sons when old: Philippines (1975) and Taiwan (1976)

	% distribution of expected reliance				
Country and sex preference	None	Little	Great	Total	(N)
Philippines					
Strong daughter (IS 1,2)	12	12	15	13	(210)
Slight daughter (IS 3)	27	25	27	26	(415)
Neutral (IS 4)	26	26	24	25	(410)
Slight son (IS 5)	26	23	18	22	(352)
Strong son (IS 6,7)	9	14	16	14	(226)
Total	100	100	100	100	
	(211)	(899)	(518)	(1,613)	
Taiwan (son preference)					
None (IS 1–4)	21	10	4	8	(162)
Moderate (IS 5)	62	67	53	59	(1,192)
Strong (IS 6,7)	17	23	43	33	(667)
Total	100	100	100	100	
	(239)	(678)	(1,104)	(2,021)	

tudes toward the family before lower strata do (Sun, 1968; Coombs and Sun, 1981). For instance, in 1970 91 percent of a national sample of childbearing-age women with no formal education in Taiwan reported that they expected to be supported by their sons in old age, compared with 78 percent of the sample with a primary school education (Coombs and Sun, 1981:1241). By 1973 the differential had changed to 75 and 51 percent, respectively. Thus, although the proportion of each educational group who expected old-age support from sons had shifted downward during the three years, a higher proportion of the group with no education still expected support.

The Value of Children survey contained measures of various factors that must be controlled in order to determine an independent relationship between expected reliance on sons and son preference. These include attitudes toward such characteristics as family continuity (importance of continuing the family name, importance of having a son, other expected economic help from sons, religiosity, and filiality), which are generally associated with the traditional, patrilineal Chinese family; the emotional value of children (measured by the importance attached to statements "because children are fun," "so as not to be lonely," and "to have someone to love," as reasons to have children);[8] and socioeconomic characteristics (age, education, urban/rural residence, husband's occupation, and family income).[9]

One may conceptualize both expected reliance and son preference as comprising two important distinctions each. For expected reliance on sons, the distinctions are whether someone expects no support or a little support from sons (none/little) and whether someone expects a great deal or little support from sons (great/little). Earlier in this paper I reported that the none/little contrast had no independent effect on fertility preferences whereas the great/little contrast had a considerable effect. For son preference there is an important distinction between whether someone has no preference or a moderate preference for sons (none/moderate) and whether someone has a strong or only moderate preference for sons (strong/moderate). A minority of the sample expected no support in old age from sons, and a minority did not prefer sons; yet it is important to distinguish these groups from the others. If they were not distinguished, the groups having no preference would be overwhelmed statistically by the numbers in the other groups.

The relationship between expected reliance on sons and son preference is schematized as fourfold (Figure 1). Since people with little or no expectations are assumed to have a moderate preference or no preference for sons, and people with great or some expectations from sons are assumed to have a strong or moderate preference for sons, most people are expected to be represented in cells A or D of Figure 1. To calculate this relationship, I treated the two son-preference dichotomies (none/moderate and strong/moderate) separately in two conditional logit multiple regressions. Odds are conditional in that people must be in one of the two categories. Categories of expected reliance are treated as 0–1 dummy-variable contrasts. (In Table 17, for instance, figures in the first column correspond to the conditional odds of having no son preference versus a moderate son preference. People

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[8] I added the measures of the emotional value of children because daughters could have more emotional value than sons. In fact, I found that the emotional value of children did have a negative effect on son preference, in particular on the dichotomy between no preference and moderate preference (De Vos, 1982). At present, economic factors disguise the effect on the bivariate level.

[9] Ideally, fear of infant or child mortality should also be controlled since it could influence the preference for a minimum of two sons rather than one son. Unfortunately, I do not have a measure of this.

FIGURE 1. Hypothetical relationship between expected reliance and son preference

	Son preference	
Expected reliance	None/moderate	Strong/moderate
None/little	A*	B
Great/little	C	D*

*A relationship between expected reliance and son preference is hypothesized to exist most strongly in cells A and D.

having a strong son preference are excluded from the computation. Figures in the first row correspond to the effect of expecting to rely on sons not at all versus only a little. The effects are considered in multiplicative terms, and identity is 1.00.) Of the many possible controls, the following were found to be important in the final analysis: the importance of continuing the family name, the importance of having a son, religiosity and filiality, the emotional value of children, and urban/rural residence. That expectations of other economic help may not be important in the multivariate context could be due to the concept's measurement (De Vos, 1982).

For the entire VOC sample the empirical relation between son preference and expected reliance on sons, controlled for various factors, is shown in Table 17. My hypothesis was that the none to strong diagonal would be important (cells A and D). In fact, there was a relationship among three of the four possible combinations of son preference and expected reliance under consideration–all but the combination of strong/moderate and none/little (cell B). A significant difference emerged in the proportions of individuals with no son preference between those who expected to rely on sons only a little and those who expected to rely on them not at all, but there was little difference in the proportions with a *strong* son preference between those groups (see Table 15).

Socioeconomic Differences

Differences among socioeconomic groups in the nature of the relationship between expected reliance on sons and son preference could indicate how the relationship might evolve during the modernization

TABLE 17. Estimated net relationship between expected reliance and son preference: Taiwan (1976)
(Using conditional logit odds)

	Son preference[a]			
Expected reliance[b]	None/moderate logit factor		Strong/moderate logit factor	
None/little	1.34*	(A)	.97	(B)
Great/little	.74*	(C)	1.38*	(D)
Total	(1312)		(1816)	

NOTE: The odds are conditional on being in either of the two (of three) possible son-preference categories. The regressions control for importance of continuing the family name, the importance of having a son in the family (general), scale of religiosity and filiality, the emotional value of children, and urban/rural residence.

* Significant at twice its standard error.

a. From the Coombs IS scale; none = IS 1–4; moderate = IS 5; strong = IS 6–7.

b. "(If you had sons) would you expect your son(s) to support you financially when old a great deal, only a little, or not at all?"

of a society. The hypothesis, depicted in Figure 2, is as follows: At an early stage of modernization the relationship is primarily between traditional (great) expectations and traditional (strong) son preference (cell D). Since most people have traditional values, other aspects of the relationship (cells A–C) are unimportant. As modernization progresses (stage 2) and more people begin to have lower expectations and neutral sex preferences, the expected-reliance–son-preference relationship involves all four combinations (cells A–D). At an even later period of modernization (stage 3), few people expect to rely on children a great deal or have a strong son preference. Thus, contrary to the situation in stage 1, the relationship is primarily between nontraditional expectations (none) and nontraditional (neutral) sex preferences (cell A). For the whole VOC sample the relationship is characteristic of stage 2 (Table 17).

I was interested in learning whether different socioeconomic strata exhibited the same type of relationship or different types. Relationships between expected reliance and son preference within different educational, residential, and income strata are shown in Table 18. (Examining the relationship within several socioeconomic groupings provides a modest consistency check on the findings.) In the lowest strata (rural, illiterate, income of less than NT$4,000 per month),

FIGURE 2. Hypothetical relationship between expected reliance and son preference at different stages in the modernization process

Expected reliance and modernization stage	Son preference	
	None/moderate	Strong/moderate
Stage 1		
None/little	0 (A)	0 (B)
Great/little	0 (C)	+ (D)
Stage 2		
None/little	? (A)	? (B)
Great/little	? (C)	? (D)
Stage 3		
None/little	+	0
Great/little	0	0

+—Relationship.
0—No relationship.
?—Possible relationship.

there were too few cases for a relationship between none/little expected reliance and son preference (cells A and B). However, there were significant relationships between great/little expected reliance and both son-preference dichotomies. They would seem closer to a stage 2 relationship than to a stage 1 relationship. Findings for the next strata (urban, primary-school education, income of NT$4,000–9,999 per month) were even more consistent with the hypothesized stage 2 relationship in that the none/none expected-reliance and the great/strong son-preference combinations were important whereas the none/strong combinations were not. Findings for the higher educational and income strata were less reliable than those for the other strata because of smaller sample sizes; but they seemed to reflect the expected-reliance–son-preference relationship of the overall sample rather than the relationship hypothesized for stage 3 of modernization.

In summary, I had speculated that there were two possible ways in which the traditional relationship between expected reliance on sons

TABLE 18. Estimated net relationship between expected reliance and son preference within selected socioeconomic strata: Taiwan (1976)
(Using conditional logit odds)

Socioeconomic stratum and expected reliance[a]	Son preference[b]	
	None/moderate	Strong/moderate
Total sample		
None/little[c]	1.34*	.97
Great/little[d]	.74*	1.38*
Rural[e]		
None/little[c]		
Great/little[d]	.56*	1.41*
(N)	(411)	(714)
Urban[e]		
None/little[c]	1.42*	1.00
Great/little[d]	.82	1.43*
(N)	(901)	(1,102)
Illiterate		
None/little[c]		
Great/little[d]	.42*	1.37†
(N)	(235)	(416)
Primary education		
None/little[c]	1.45†	1.03
Great/little[d]	.97	1.35*
(N)	(782)	(1,090)
Junior high+ education		
None/little[c]	1.21	.95
Great/little[d]	.45	1.52*
(N)	(278)	(286)
Income <4,000[f]		
None/little[c]		
Great/little[d]	.42*	1.49*
(N)	(203)	(354)
Income 4,000–9,999[f]		
None/little[c]	1.72*	.80
Great/little[d]	.92	1.30*
(N)	(691)	(926)

TABLE 18. *(continued)*

Socioeconomic stratum and expected reliance[a]	Son preference[b]	
	None/moderate	Strong/moderate
Income 10,000+[f]		
None/little[c]	.96	.93
Great/little[d]	.56	1.20
(N)	(251)	(276)

NOTE: The odds are conditional on the respondent being in either one or the other category (out of three possible). Cells are blank if the total number of respondents expecting to rely not at all is less than 35. The regressions control for importance of continuing the family name, importance of having a son in the family (general), religiosity and filiality, the emotional value of children, and rural/urban residence.

* Significant at twice its standard error.

† Significant at 1.86 times its standard error.

a. "(If you had sons) would you expect to rely on your son(s) a great deal or only a little for financial support when old?"

b. From Coombs ideal-sex scale. "None" = IS 1–4; "moderate" = IS 5; "strong" = IS 6–7.

c. Cells A and B.

d. Cells C and D.

e. Rural respondents were those who had lived their entire lives in a rural area; urban respondents were all others.

f. Family income calculated in NT$ per month.

for financial support in old age and son preference might weaken. One was by the attenuation of one or both of the traditional values. The other was by greater independence between the two values despite their persistence. The findings regarding the possibility of the second way were negative. Where there were enough cases for the possibility of significant covariation between expected reliance and son preference, significant covariation appeared. The implication of these cross-sectional findings is that a relationship between expected reliance on sons and son preference might disappear only when expected reliance or son preference disappears.

The Effect of a Government Pension

One policy implication of the relationship between expected reliance on sons for old-age support and son preference is that a government pension might weaken son preference if it weakened expected reliance. The Taiwan VOC survey asked the following question: "If the government established a good program so that you would be paid a pension when you grew old . . . [how] . . . important [would it be] to have a son in the family?" Answers to the question were used to evaluate the possible effect of a pension on the relationship between expected reliance and son preference. However, I approached the exercise cautiously. A hypothetical question is difficult for people to answer, especially if it describes a situation about which they might not have previously thought. People may have varying degrees of trust in a government pension program and may estimate their reactions accordingly. They may differ considerably in their interpretations of a "good" pension program. Whereas some may interpret "good" to mean "realistically possible given present government resources," others may consider it to mean "in the best of all possible worlds." Moreover, only people who expected at least some support from their sons were asked this question because the introduction of a pension program would presumably have no effect on the son preference of respondents who said they expected no support from sons.

The effect of controlling for the resulting pension variable on the relationship between great/little expected reliance and son preference is shown in Table 19. Son preference, as before, was treated as two dichotomies. Columns 1 and 3 of Table 19 show the estimated effects of expected reliance without controlling for pension. (These effects may differ slightly from the previous results because I did not include respondents who did not expect to rely on sons at all.) Columns 2 and 4 show the coefficients with pension controlled. The figures showed no effect of controlling for pension on the coefficient for either the son-preference dichotomy for the total sample (row 1) or for the none/moderate cells among different residential, educational, or income strata.

Table 19 does reveal a slight effect of controlling for pension on the relationship between great/little expected reliance and strong/moderate son preference among the lower strata. If one compares the figures for rural respondents in columns 4 and 5, for instance, the great/little expected reliance coefficient is altered from a significant 1.32 to an insignificant 1.18 when pension is controlled. Although less dramatic, there is a similarly significant difference among the illiterate and low-income groups with pension controlled.

A statistical test showed that the coefficient controlled for pension cannot be considered significantly different from the coefficient not controlled for pension, but this finding was expected given the large

TABLE 19. Effect of a hypothetical government pension on the relationship between expected reliance and son preference within selected socioeconomic strata: Taiwan (1976)
(Using conditional logit)

	Son preference					
	None/moderate			Strong/moderate		
Socioeconomic stratum	No control for pension (1)	Control for pension (2)	(N) (3)	No control for pension (4)	Control for pension (5)	(N) (6)
Total sample	.77*	.77*	(1,128)	**1.39***	**1.33***	(1,631)
Rural	.55*	.46*	(395)	1.32*	1.18	(686)
Urban	.76*	.88	(733)	1.43*	1.41*	(945)
Illiterate	.48*	.47*	(235)	1.39†	1.33	(418)
Primary education	.96	.94	(716)	1.35*	1.28*	(1,010)
Junior high+ education	.52	.54	(177)	1.45*	1.48*	(203)
Income <4,000	.42*	.40*	(193)	1.49*	1.39	(342)
Income 4,000–9,999	.95	.97	(607)	1.29*	1.24*	(838)
Income 10,000+	.58	.60	(160)	1.20	1.21	(191)

NOTE: The regressions control for importance of continuing the family name, importance of having a son in the family (general), religiosity and filiality, emotional value of children, and rural/urban residence. Respondents' reactions to a hypothetical government pension were obtained from responses to the question: "If the government established a good program so that you would be paid a pension when you grew old . . . [how] . . . important [would it be] to have a son in the family?" Their expected reliance was measured from responses to the question: "(If you had sons) would you expect your son(s) to support you financially when old?" Sex-preference responses were collapsed from the Coombs IS scale to IS 1–4 (no son preference), IS 5 (moderate son preference), and IS 6–7 (strong son preference).

* Significant at twice standard error.

† Significant at 1.86 times standard error.

standard errors of all the estimates. It suggests that the relationship between great/little support expectations and fertility preferences was strongest among the lower strata, and that the lower strata also demonstrated a possible effect of a pension on the relationship between expected reliance and son preference. These were the strata for which little or no old-age insurance existed aside from children.

CONCLUSION

This study has examined Philippine and Taiwanese women's expectations of relying on children for financial support when old: the level and distribution of expectations, their determinants or correlates, and their relation to several demographic and socioeconomic factors. Support of the elderly, be it through society-wide or intrafamily transfers, is an issue faced by all societies, and it may have important welfare and demographic consequences.

Summary of findings

Respondents in both the Philippines and Taiwan perceived considerable economic old-age security value in children. A sizable proportion of both samples mentioned old-age security when asked about the advantages of having children. The study revealed two major differences between the societies, however. In the Philippines a majority expected to rely only a little on children for financial support when old, whereas in Taiwan a majority expected to rely on children a great deal. Cultural, historical, and developmental factors may explain this difference. The second major difference was that, in the Philippines, respondents expected to rely approximately equally on sons and daughters for economic support when old whereas, in Taiwan, they expected to rely on sons much more than on daughters. This latter difference might be explained by the different traditional family systems in the Philippines and Taiwan. The former society has been bilineal whereas the latter has been patrilineal.

Support expectations were negatively related to standard indicators of socioeconomic status in both the Philippines and Taiwan. The important exceptions were that exposure to mass media and age had significant net relationships in Taiwan but not in the Philippines. The reasons are unknown.

Differences in socioeconomic status probably indicate several things. First, they indicate differences in prestige, power, and financial resources. The more, particularly financial, resources people expect to have in old age, the less they may expect to rely on children for financial support. Socioeconomic differences may also indicate differences in attitudes toward independence and family relations since each social group tends to share different socialization experiences. If people in higher strata tend to believe that family relationships do not include financial interdependencies, or that young children are to be provided for but adult children "have their own lives to lead," then one could assume that people in higher strata would expect to rely less than other people on children in old age.

The idea that attitudes had an important effect on support expectations was tested by a multivariate analysis that included socioeconomic and attitude measures. Although the measurement of relevant attitudes was limited, especially in the Philippines, in general the inclusion of attitude variables reduced the independent effect of socioeconomic characteristics on support expectations. Attitude variables also tended to have significant independent effects on support expectations in both countries.

The most important attitude measure was a scale of expectations of other economic help from children. A scale called "other economic help," this variable measured whether or not respondents expected children to help support their siblings' education or send part of their wages home when children began earning. Individuals' sense of personal efficacy had an independent effect on expected reliance on children in the Philippines. The Taiwan survey asked several additional questions about saving and self-sufficiency in old age, which proved to be significantly related to expected reliance on children for financial support in old age.

A fairly consistent difference emerged between countries in the size of the effects of the socioeconomic characteristics on support expectations. The socioeconomic effects tended to be smaller in the Philippines than in Taiwan, especially in the case of education. This finding could reflect the more rapid economic development that has occurred in Taiwan, possibly resulting in larger gaps between the social groups. Also noteworthy was the finding that, in the Philippines, urban/rural residence had no net relationship with whether or not an individual expected any old-age support from children.

There was clear support for the hypothesis that expected reliance on children for financial support when old would affect fertility preferences in both the Philippines and Taiwan. The effect appeared specific to higher-order parities: to four or more children in the Philippines and to wanting a fourth child in Taiwan. An attempted specification by socioeconomic group found that the old-age security effect was significant among lower strata but not among higher strata. However, the level of stratification below which there was an effect differed between the Philippines and Taiwan. The effect was significant only among the lowest strata in the Philippines whereas it was significant among all but the highest strata in Taiwan. This difference could be explained by several factors, including cultural background, recent rates of economic development, and sample size. Attempts at specifying the old-age security effect by social-psychological characteristics or by family orientations proved unsuccessful, perhaps because of the difficulty of creating comparable measures across societies.

Expected reliance on children for financial support in old age was related to sex preferences in Taiwan but not in the Philippines. This finding is probably explained by the difference in the functional value of daughters and sons in the two cultures. In Taiwan sons but not daughters have been expected to support elderly parents. In the Philippines, in contrast, both daughters and sons have been expected to support elderly parents.

A relationship between expected reliance on sons when old and son preference in Taiwan has implications for the modernization of the Chinese family, because both parental support and son preference have been central to the traditional Chinese family structure. This study found the two family orientations to be related to each other regardless of other elements of a patrilineal system, such as the importance of having a son to continue the family line. The findings supported the idea that a decline in expected reliance on sons might affect a decline in son preference. In contrast to the relationship between support expectations and fertility preferences, however, the relationship between support expectations and son preference did not appear to be affected by socioeconomic status in Taiwan, except to the extent that virtually everyone in the lower strata expected to rely on sons for at least a little financial support. The support-expectations–son-preference relationship among the upper strata appeared to reflect the relationship among the entire sample. There was some indication that the introduction of a "good" government pension might reduce the effect of support expectations on a strong son preference among rural, illiterate, and poor respondents.

Policy implications

In both societies respondents in the higher socioeconomic strata had lower expectations of relying on children than did lower socioeconomic respondents. Their lower expectations could become more typical of all socioeconomic groups in the future, because education is becoming more widely available and the attitudes of the middle class may diffuse downward over time. For whatever reasons, be they financial or attitudinal, such lower expectations imply the expectation of relying on financial sources other than children in old age. Presumably these sources would be pensions, personal savings, continued employment, or some combination of these.

It is improbable that continued employment at older ages will substitute for support from children, since modern retirement tends to be at younger rather than older ages (see C.K. Park, 1975). Nor can most "older" elderly (70+ years) be expected to support themselves by continued employment. It is more likely that personal savings, private pensions, or government social security systems will substitute for at least some financial assistance from children (see Palmore, 1975: chap. 6).

According to unpublished tabulations provided by Ronald Freedman (Population Studies Center, University of Michigan), in Taiwan there was an apparent shift between 1973 and 1980 from children to personal savings as the expected primary means of support in old age. Whereas 52 percent of a national sample of wives 15–44 years old expected to rely on children as their primary means of support in 1973, this proportion declined to only 28 percent by 1980. Over the same period the proportion expecting to rely on personal savings as the primary means of support increased from 41 to 61 percent. The proportion expecting primary support to come from pensions grew only from 8 to 12 percent of the sample . Yet to be able to rely primarily on personal savings requires an income considerably above subsistence level, trustworthy savings institutions, and faith that economic prosperity will continue. That incomes will be large enough to permit sufficient savings by more than a small proportion of the population in either the Philippines or Taiwan is open to question.

Nor is there reason to assume that public old-age insurance schemes naturally arise from industrialization or even from a perceived need or desire for them. For instance, Japan, which is the only culturally non-Western country to have completely modernized, appears to have a remarkably low level of welfare spending relative to other indicators of socioeconomic development (Wilensky, 1975:122); and public old-age welfare competes for limited funds with other government services such as education, housing, public health, and road building. Old-age provisions may have lower priority than other programs because the family has presumably cared for its elderly in the past and other needs may be more pressing.

Nor will the problematic financial aspect of old-age welfare schemes necessarily attenuate with increased prosperity. Even rich countries like the United States have problems financing comprehensive social security schemes. It is also unclear, given the average quality of nursing home care and present bureaucratic programs, that currently modernizing societies would want to repeat the experience of the West.

In a recent article Chan (1979) evaluated three possible insurance schemes in the Chinese context: (1) noncontributory public assistance, (2) social insurance including labor insurance, and (3) a provident fund. In his estimation the provident fund had the most promise for developing countries from the viewpoint of resource mobilization and population coverage. Provident funds require employees and employers to set aside a certain percentage of their wages into a government fund. This fund may cover various contingency needs of workers and their dependents such as disability, retirement, or death. Between acquiring the funds and paying them out, the fund can invest money in development schemes. In Singapore provident funds have been used to help pay for a massive rehousing of the population. By 1980 a majority of Singaporeans lived in and owned modern flats, which provided them with some security for retirement years (Yeh, 1975). The effect of such schemes on the relationship between parents and children is unclear. Potentially, parents are provided with some security from outside sources, which may be augmented by contributions from children.

Might a government pension scheme that partially substituted for the financial support of children help to reduce desired fertility? Expecting only a little economic support from children rather than a great deal of support has a dampening effect on fertility preferences.

The effect is strongest among lower socioeconomic groups not yet covered by existing pension or social security programs, and it is specific to the preference for higher-order children.

The notion that expanding old-age insurance could be a viable antinatalist policy has been criticized for several reasons. For one, the idea is highly conjectural. However, a cross-sectional study of developing countries found pension coverage and benefit level to be related to lower fertility five years later (Entwisle, 1979; Entwisle and Winegarden, forthcoming; see also Nugent and Gillaspy, 1983).[10] A second criticism is that the antinatalist policy would be indirect and very expensive. The cost-effectiveness of such a program might not be as high as more direct attempts to reduce population growth, such as family planning programs or the employment of women. But social insurance schemes can contribute to social and economic development as well as be antinatalist (Singer, 1968; Shome, 1978; Lapman, 1968); and they need not compete with other antinatalist policies. In short, the idea that a pension or provident fund scheme could simultaneously have antinatalist effects and positive economic-development effects deserves more serious and in-depth analysis than it has been given up to now.

The VOC study produced tentative evidence that the introduction of a pension might weaken the effect of expected reliance on son preference in Taiwan among rural respondents and respondents with low incomes. Practically no other empirical evidence exists on this topic that I know of, but the idea that introducing an old-age pension might reduce son preference among individuals presently not covered by such a pension warrants further inquiry.

Study limitations and directions for future research

The present study had three main limitations.

First, it addressed theoretical issues pertinent to all or most developing countries but studied only two countries, the Philippines and Taiwan. It is tempting to generalize the findings to other countries, and undoubtedly some generalization is valid. But even between

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[10] The reasons for the development of pension and old-age welfare programs are unclear. Family, economic, and political explanations have all been offered (Wilensky and Lebeaux, 1958; Cutright, 1965; Rimlinger, 1971; Wilensky, 1975). Nor is it clear that such historical explanations, even if we knew what they were, would be applicable to presently modernizing countries.

Taiwan and the Philippines, differences in cultural background, history, and recent economic experience may be of possible importance for the old-age economic security value of children. The study found that the relationship between old-age support expectations and the strength of son preference was specific to Taiwan. Clearly, there is need to study other countries before one can be truly confident about the generalizability of most of the study findings.

The second major limitation of the study was that it investigated the old-age economic security value of children at only one time, using cross-sectional survey data. Yet the root of much of the theoretical interest in this value of children stems from the idea that the value changes with economic development, specifically that responsibility for old-age support tends to be focused on family members in traditional societies but tends to be diffused among an entire working-age generation in modern societies. I suggested that at times socioeconomic differentials help indicate directions of change; that is, in societies undergoing rapid socioeconomic development, attitudes held by a well-educated group at one time might become more common among a less educated group at a future time. If couples' support expectations of children are lower among higher socioeconomic status groups than among lower status groups, it could indicate that support expectations are declining throughout a society. Longitudinal analysis has the obvious advantage of addressing issues of change directly.

A third limitation of the study was that it did not have good measures for all of the factors that could be important determinants of expected reliance on children or that needed to be controlled when estimating a relationship between expected reliance on children and fertility preferences or son preference. Especially for the Philippines, the number of attitudes measured concerning old-age were quite limited. In establishing independent relationships between support expectations and fertility preferences or son preference, it would also have been more satisfying to control for a better measure of other economic values of children and a better measure of the fear of child mortality.[11] This comment is made not to undermine the potential usefulness of the study findings, but to alert researchers to the need for such measures in future studies.

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[11] The control for other economic values of children did not distinguish well between people who expected a "great deal" or "only a little" economic help of other kinds, yet it was just this distinction that proved important for the old-age support variable. Fear of a child death had to be measured approximately by whether or not the respondent had ever experienced an infant or child death.

In conclusion, this study has contributed to our understanding of the old-age economic security value of children, its level and distribution, its relation to socioeconomic characteristics and attitudes, its substantial effect on fertility preferences, and, in a traditionally patrilineal society, its significant relationship with son preference. The hypotheses addressed here need further exploration with better data sets, both for additional time periods and for additional countries. The hypotheses tested are only a subset of those surrounding the interdependence of parents and children and its relation to demographic phenomena. The efforts made herein will, I hope, provide a stepping stone for such inquiry.

APPENDIX: CONSTRUCTION OF SELECTED VARIABLES

The construction of variables that may be of particular interest to the reader is reported below. For details regarding other variables used in the study, see De Vos (1982) or write to the author.

Residence

The survey initially determined respondents' residence as:
Philippines: urban, barangay (town center), or barrio (rural).
Taiwan: urban or rural.
The survey also asked about the respondent's residential background:
(If rural) "Have you ever lived in a large town or city?"
(If urban) "Have you ever lived on a farm or in the country?"
The initial determination and answers to the subsequent questions were used to form the residence variable used in the study.

Besides distinguishing between urban, barangay, and barrio residents, the Philippine variable also classifies the backgrounds of barangay residents: urban, barangay with some urban experience, barangay with no urban experience, and rural barrio.

In Taiwan, the variable distinguishes people who always lived in an urban area from those who had always lived in a rural area and from those who had some experience living in both areas: urban, mixed (rural resident with some city experience or urban resident with some rural experience), and rural.

Social-psychological orientations

The VOC survey asked respondents to agree or disagree with four social-psychological statements, three of which could be combined into a single scale called "personal efficacy." Responses to the four statements were coded similarly.

1a. Philippines: "Getting ahead in life is mostly a matter of luck." LUCK
1b. Taiwan: "To you, getting what you want has little or nothing to do with luck." LUCK
2. "It is not always wise to plan too far ahead because many things turn out to be a matter of good or bad fortune anyway." PLAN
3. "Many times you feel that you have little influence over the things that happen to you." INFL
4. "When you make plans, you are almost certain you can make them work." CRTN

Personal efficacy

Responses to the first three statements—LUCK, PLAN, INF—were scaled into a four-point scale (one point for each strong agree answer) measuring personal efficacy. Responses to the fourth, CRTN, statement were not related to anything else and were dropped from the analysis.

Fertility preferences (Coombs IN)

Coombs IN, as a measure of fertility preferences, does not measure number of children preferred. However, it overcomes several disadvantages inherent in previously devised measures of fertility preferences. It uses probes to measure whether a respondent would prefer more or fewer children than her first stated preference. Second, the measure is theoretically independent of sex preference, although it may be related to sex preference empirically. Third, Coombs IN is more independent of actual fertility than are measures based on current parity. Fourth, Coombs IN tends to have smaller standard errors than other measures of fertility preferences.

The scale is constructed from answers to an initial question and subsequent probes that depend on the answer to the first question:

> "If you were to start your family all over again, and you knew that you would have an equal number of boys and girls, how many children *in all* would you most like to have—no children at all, or one boy and one girl, two boys and two girls, or three boys and three girls?"
>
> "If you didn't have ___ boy(s) and ___ girl(s), would you rather have ___ boy(s) and ___ girl(s) or ___ boy(s) and ___ girl(s) (or no children)?"

The answers are "unfolded" into a decision tree in which the dash distinguishes the order of questioning:

1. none
2. 1 each—none
3. 1 each—2 each—none
4. 1 each—2 each—3 each
   2 each—1 each—none
5. 2 each—1 each—3 each
6. 2 each—3 each
7. 3 each

Sex preferences

The measures of sex preference used here are derived from the Coombs IS measure of individual preferences. The relatively new measure represents an important improvement over past measures of sex preference because it measures individual attitudes independently of fertility preferences. It is also cross-cultural comparable (Coombs, 1975). For this study, the final trichotomous variables measuring sex preference differ for each country because many Filipinos prefer daughters as well as sons whereas most Taiwan respondents preferred sons only. The final variables measure strength of sex preference.

Coombs IS

> "If you were to have *exactly three* children altogether, how many would you want to be boys and how many girls?"
> "If you didn't have ___ boy(s) and ___ girl(s), would you rather have ___ boy(s) and ___ girl(s) or ___ boy(s) and ___ girl(s)?"

Answers to the questions form a tree in which the dash distinguishes the order of questioning.

1. 3 girls
2. 2 girls and 1 boy–3 girls
3. 2 girls and 1 boy–1 girl and 2 boys–3 girls
4. 2 girls and 1 boy–1 girl and 2 boys–3 boys
   1 girl and 2 boys–2 girls and 1 boy–3 girls
5. 1 girl and 2 boys–2 girls and 1 boy–3 boys
6. 1 girl and 2 boys–3 boys
7. 3 boys

Strength of Sex Preference (Philippines)

1. None (IS 4)
2. Moderate (IS 3,5)
3. Strong (IS 1,2,6,7)

Son Preference (Taiwan)

1. None (IS 1–4)
2. Moderate (IS 5)
3. Strong (IS 6–7)

Other economic help from children

These questions are similar to the questions on expected reliance on sons or daughters for support when old, except that answers do not distinguish between expecting "only a little" or "a great deal" of help.

"(If you had sons) would you expect your sons to:

a. Give part of their salary to you when they begin working?
b. Help support younger brothers or sisters through school?"

"(If you had daughters) would you expect your daughters to:

c. Give part of their salary to you when they begin working?
d. Help support younger brothers or sisters through school?"

The answers are coded as:

1. No
2. Depends
3. Yes

Responses of "no" to all the questions were put into the "no" category. Responses of "it depends" to any of the questions were put into the "depends" category. Responses of "yes" to all four questions were placed into the third, "yes" category. In the Philippines, the "no" and "depends" categories were combined because there were so few responses in either category. In Taiwan, the original three-category variable was retained.

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